

<b>AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE N/A		PAGE OF PAGES 1   2	
2. AMENDMENT/MODIFICATION NO. Thirty-Three (33)		3. EFFECTIVE DATE See Block 16C		4. REQUISITION/PURCHASE REQ. NO. See Block 12	
5. PROJECT NO. (If applicable)		7. ADMINISTERED BY (If other than Item 6)		CODE	
ISSUED BY NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		CODE		NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE	FACILITY CODE
(X) 9A. AMENDMENT OF SOLICITATION NO.	9B. DATED (SEE ITEM 11)
X 10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

## ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Clause 52.243-1 Changes Fixed Price—Alt. II
	d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4164B, 4171 and 6064 at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J. T. Felicitia Manager, NASA Contracts		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall	
15B. CONTRACTOR/OFFEROR J. T. Felicitia (Signature of person authorized to sign)	15C. DATE SIGNED 2/17/2000	16B. UNITED STATES OF AMERICA BY Sandra Marshall (Signature of Contracting Officer)	16C. DATE SIGNED 3/15/00

**1. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment E Interface Control Document for the Solar X-Ray Imager (SXI)

Change paragraphs 3.4.5.1-2, 3.4.5.1.1-1 and 3.4.5.1.4-6 to reflect the revised voltage requirements stated in CCR 6064.

Attachment H, List of Government Furnished Property

Change the SXI Simulator date to February 28, 2000.  
Add SXI Data Playback Unit with a date of January 15, 2000.

**2. Replace the contract areas listed below with the enclosed revised pages:**

Attachment H  
3 pages

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**CCR 4171 and 4164B Mod 33**

**Attachment H**

**LIST OF GOVERNMENT FURNISHED PROPERTY**

**August 26, 1997**

**Attachment H (CCR4171 and 4164B)**  
**LIST OF GOVERNMENT FURNISHED PROPERTY**

ITEM (GFP)	DATE AVAILABLE	LOCATION (SOW)
Finite Element Models Imager Sunder SXI	SCR SCR SCR	3.2.2.1
Thermal Models Imager (Detailed TMG) Sunder (Detailed TMG) SXI (Reduced Thermal Model)	SCR SCR SCR	3.2.5.1
Thermal Distortion Models Imager Sunder	SCR SCR	3.2.5.3
Test Execution System (TES)	July 1999	
Prototype Instruments S/N02 Imager S/N02 Sunder SXI Mass Model SXI Engineering Model	July 1999 July 1999 Sept. 1, 1999 May 2000	3.4.3.1
Flight Instruments S/N08 Imager S/N08 Sunder S/N09 Imager S/N09 Sunder S/N10 Imager S/N10 Sunder S/N11 Imager S/N11 Sunder SXI-N SXI-O SXI-P SXI-Q	April 2000 April 2000 April 2001 April 2001 April 2003 April 2003 April 2005 April 2005 Sept. 2000 April 2002 April 2005 April 2007	
Tooling Plates & Associated Drawings Imager Sunder	March 1999 March 1999	
Instrument Drawings & ICDs Imager Sunder SXI	Award Award Award	
Instrument Operations Documentation		3.6.1.2



Imager Sounder SXI	Inst. Del'y - 3 Mo. Inst. Del'y - 3 Mo. Inst. Del'y - 3 Mo.	
Instrument Simulators Imager Sounder SXI	GOES-N *ESD -20 Mos. GOES-N ESD -20 Mos. <u>February 28, 2000</u>	
IR Calibration Targets (T/V Testing) (And associated controllers, plumbing, etc.): Space Targets (T/V Tests) Cooler Targets (T/V Tests) Narrow Field Collimator (Ambient Test) Integrating Sphere (Ambient Test) Imager/Sounder Lifting Fixture	S/N08 Del'y S/N08 Del'y S/N02 Del'y S/N02 Del'y S/N02 Del'y	
Wide Field Collimator with Targets	March 1999 thru November 1999 and March 2000	3.4.4.3:1.2
SSGS Related Information GOES I/M Sftwr. & Databases GOES I/M Documentation (Electronic)		3.5 GFE (1) GFE (2)
GOES N Ground Network Compatibility Test Suite	Prior to In-Plant Environment Tests	3.6.2.1.1
<u>SXI Data Playback Unit</u>	<u>January 15, 2000</u>	

\*ESD = Earliest Storage Date

AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT		1. CONTRACT ID CODE N/A	PAGE OF PAGES 1   2
2. AMENDMENT/MODIFICATION NO. Thirty-Four (34)	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. See Block 12	5. PROJECT NO. (if applicable)
ISSUED BY NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		7. ADMINISTERED BY (if other than item 6) NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE (X)	9A. AMENDMENT OF SOLICITATION NO.	FACILITY CODE 9B. DATED (SEE ITEM 11)
X	10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

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(a) By completing items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (if required)

C: BX B/NC: 427 N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Clause 52.243-1 Changes Fixed Price—Alt. II
	d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4174, 8018C, 8024C and 8026 at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J. T. Felicita Manager, NASA Contracts	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall
15B. CONTRACTOR/OFFEROR <u>J. T. Felicita</u> (Signature of person authorized to sign)	15C. DATE SIGNED 4/9/00
15B. CONTRACTOR/OFFEROR	16B. UNITED STATES OF AMERICA BY <u>Sandra Marshall</u> (Signature of Contracting Officer)
	16C. DATE SIGNED 4/10/00

**1. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

**Attachment A, Statement of Work**

Add the following to paragraph 3.4.4:

The SXI GFE instrument shall be allotted 20 hours for safe-to-mate/electrical signal characterization activities as defined in the SXI/Spacecraft GSE ICD. 20 hours shall be allotted for the SXI Engineering Model and each and every SXI Flight Model.

**Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)**

Change paragraphs 2.2.2 and 3.4.3.1 and Appendix B Tables B-1, B-2 and B-3 to reflect revised telemetry nomenclature and reduced survival temperature as stated in CCR 8018C.

Correct typographical errors in paragraphs 3.4.1.3.1 and 3.4.5.7.1 as stated in CCR 8026.

**Attachment L, Interface Control Document for the Solar X-Ray Imager Ground Support Equipment and Hughes GOES Satellite (N.O.P.O) Integration and Test**

Change paragraphs 2.2.2, 3.15.5.2-1, -2, -3, -4, -5, -6, -7 and -8 as reflected in CCR 8024C to resolve testing issues.

**2. Replace the contract areas listed below with the enclosed revised pages:**

**Attachment A, Statement of Work**

3.4.4

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

### 3.4.3.5 Flight Instrument Integration

The spacecraft contractor shall provide all resources necessary to perform the electrical, mechanical, and thermal integration of the Imager, Sounder, Solar X-ray Imager, and Space Environment Monitor instruments onto the spacecraft. The spacecraft contractor shall develop and maintain integration and handling procedures which are agreeable to the instrument contractors.

In the spacecraft contractor's SXI integration sequence, the contractor shall allot one day for the SXI contractor to execute an SXI functional test after each major integration step; for example, after SXI integration to the mounting panel; after mounting panel integration to the solar array yoke; and after yoke integration to the spacecraft body. If any of these major integration steps are subsequently reversed (e.g., if the yoke is removed from the spacecraft), the spacecraft contractor shall allot one day for the SXI functional test after the de-integration step and then one other day after the re-integration step. These test times are in addition to those defined in Table 3.4.5.1. Spacecraft integration and testing may be conducted in parallel if it does not interfere with or compromise SXI testing. The SXI functional test will be executed by the SXI contractor with support from the spacecraft contractor.

### 3.4.4 Functional Tests

The spacecraft contractor shall provide all test facilities and all the resources necessary to define, prepare, perform, document, and analyze all functional and performance tests associated with GOES N-Q. The spacecraft contractor shall conduct functional testing as defined in S-415-22 section 8.0. In addition, launch vehicle adapter compatibility shall be verified by test on all spacecraft prior to shipment to the launch base. System testing is defined in section 3.6.2.3

All electrical interfaces shall be verified prior to any first time connection. Safe-to-mate procedures shall be implemented for all interfaces between any two of the following: spacecraft, GFE, EGSE, pyrotechnics, electrical explosive devices, SSGS, ATE, and any facility power. The EGSE shall be demonstrated to NASA to verify that it is adequate for the intended use. EGSE shall be under configuration control prior to the demonstration, and prior to use for spacecraft tests. The spacecraft contractor shall ensure that the instrument GSE is on, operational, and properly connected to the spacecraft GSE prior to any powered testing of an instrument.

The SXI GFE instrument shall be allotted 20 hours for safe-to-mate/electrical signal characterization activities as defined in the SXI/Spacecraft GSE ICD. Twenty (20) hours shall be allotted for the SXI Engineering Model and each and every SXI Flight Model.

CCR4174

#### 3.4.4.1 GOES-N Functional Tests With GFE Prototype Imager, Sounder and Engineering Model SXI

For the GOES-N spacecraft only, the spacecraft contractor shall perform the following tests after integration of the prototype Imager and Sounder instruments and an engineering model of the SXI:

1. A test with the spacecraft suspended with all mechanisms operating in an on-orbit mode to measure dynamic interactions between spacecraft and instrument components. The spacecraft contractor may substitute a similarly comprehensive test using the prototype Imager and Sounder instruments and engineering model SXI to verify dynamic interactions between the instruments and spacecraft mechanisms.

## S-415-23 GOES N-Q Statement of Work

2. A test with all communications functions and instruments operating in an on-orbit mode to measure electromagnetic interactions between the spacecraft and instruments.

The times for these tests are not included in the instrument schedule duration.

### 3.4.4.2 GOES N-Q Functional Tests with Flight Instruments

The spacecraft contractor shall set aside the schedule durations defined in Table 3.4.5.1 for instrument functional testing at the test phases indicated. The spacecraft contractor shall provide access to the spacecraft, spacecraft GSE, and personnel as required to support the testing. The spacecraft contractor shall support instrument Pre-Vibration Functional Testing by orienting the spacecraft such that the Imager and Sounder cooler cover door hinge axes and telescope optical axes are perpendicular to the ground. If the SXI is integrated on the solar array yoke when a first-motion and/or deployment test of the solar array is performed (during the Baseline Performance and/or the Launch Base Functional phase), the spacecraft contractor shall divide the test time allotted for the SXI in Table 3.4.5.1 such that there are at least two days of SXI test time both before and after the array test. Spacecraft testing may be conducted in parallel if it does not interfere with or compromise instrument testing.

In addition, the spacecraft contractor shall perform the following tests with the flight instruments for each of the GOES N-Q spacecraft.

1. A test with the spacecraft suspended with all mechanisms operating in an on-orbit mode to measure dynamic interactions between spacecraft and instrument components. The spacecraft contractor may substitute a similarly comprehensive test using the Imager, Sounder, and SXI instruments to verify dynamic interactions between the instruments and spacecraft mechanisms.
2. A test to measure the spacecraft magnetic dipole.
3. A test with all communications functions and instruments operating in an on-orbit mode to measure electromagnetic interactions between the spacecraft and instruments.
4. Calibration of all flight sensors (actual vs measured) and mechanisms (actual vs commanded).

The time for these tests are not included in the instrument schedule duration.

### 3.4.4.3 INR Pre-launch Spacecraft Test Requirements

The spacecraft contractor shall perform the tests necessary to verify the successful system integration of the Imager/Sounder and spacecraft subsystems comprising and/or supporting the INR subsystem (CDRL SE-2.4-01). These tests shall verify that GOES N-Q meets the INR derived requirements and objectives, based on the INR specifications.

The contractor shall propose the tests to be performed; provide the test plan and test procedure in accordance with CDRL SE-2.4-01; provide the necessary input data, files, etc. required to perform the test; and conduct the actual testing.

The spacecraft contractor shall evaluate and document all analyses of the data and information from all tests, including development bench testing, qualification testing, acceptance testing, and compatibility testing of the INR-related flight hardware, software and algorithms. The spacecraft contractor shall provide a standard format to be used to report the results of all tests.

## S-415-23 GOES N-Q Statement of Work

The spacecraft contractor shall provide and maintain an INR test schedule showing initial availability of each unique GSE and any associated software required for the conduct and/or analysis of the test results. The test schedule shall reflect the requirement for any government furnished data, such as star/landmark data from on-orbit spacecraft (GOES I/M series).

### 3.4.4.3.1 Spacecraft Subsystem Tests

The purpose of subsystem testing is to verify the functional and computational performance of all spacecraft INR subsystem components. This shall be accomplished by closed loop testing of all INR components provided by the contractor and shall exercise all electrical interfaces using test scenarios which duplicate the worst case on-orbit operational modes and geometries. The output of all subsystem components will be verified both qualitatively and quantitatively. In particular, the comprehensive verification of all INR compensation signals shall be demonstrated during these tests. One important aspect of this testing shall be the confirmation that compensation signals are compatible with the instrument servos. Exercising of the ACS may be accomplished using simulated sensor/actuator signals and/or dynamic simulation with a controllable platform. External interfaces with the INR subsystem during these tests, such as with instruments and ground system elements, shall be provided by flight-like hardware and/or dynamic simulation. In support of these tests, the spacecraft contractor shall provide the data ingest, archive and processing capability to quickly and accurately verify all INR related signals and on-board computations.

The spacecraft contractor also shall prepare INR related system performance reports in accordance with CDRL SDA-3.2.16-02.

### 3.4.4.3.2 System Tests

The primary objective of system testing is the verification of INR operation and performance at the spacecraft level with all spacecraft components and instruments integrated. Tests shall exercise all worst case expected on-orbit INR operational modes and geometries. As a final verification of system pointing performance, these tests shall include both electrical testing of all INR functions as well as an optical test using the GFE wide field of view collimator (WFC) and wide field of view targets to be provided by the government and, if desired, target(s) developed by the spacecraft contractor. The test data shall be recorded for later testing with the NOAA SSGS.

As a minimum, the WFC shall be used to determine the Imager scan linearity and the amount of shear. These tests shall be performed with IMC both on and off using different orbits and attitudes. Specifically, the spacecraft contractor shall verify image quality over the entire Imager field of regard while operating the INR subsystem. These tests shall be performed for both qualification and acceptance testing on GOES-N, and as acceptance tests on GOES-O,P,Q. For INR tests involving the Imager and Sounder, the spacecraft contractor shall coordinate the development and execution of the tests with the Imager/Sounder contractor.

The final part of the INR system testing shall be the verification of spacecraft subsystem operation with a replicated and/or emulated ground system. Tests shall be performed with IMC both on and off, and with different orbits and attitudes to fully exercise all of the INR supporting hardware, software, and algorithms.

National Aeronautics and  
Space Administration  
**Goddard Space Flight Center**  
Greenbelt, MD 20771



Reply to Attn of:

214.2

January 27, 2000

MEMORANDUM FOR THE FILE

SUBJECT: NAS5-98069, Modification No. 34

The GOES Project has generated several changes to the statement of work, specification and other technical documents, as a result of their ongoing review of the spacecraft and instrument requirements. The Project has separated these changes into individual Configuration Change Requests (CCR's) and the Project Configuration Change Board approves these CCR's.

This modification issues and definitizes the following CCR's:

4174, 8018C, 8024C and 8026.

The fixed price of the contract will not be increased as a result of these CCR's. The COTR and the Project Systems Engineer assessed each CCR for its individual impact. This evaluation considered the possible credit or cost associated with each CCR along with the overall benefits obtained by issuing a change or relieving a requirement. Requirements that were relieved are beyond the level that is actually programmatically required so the Government is not relinquishing a requirement that would generate a programmatic concern or a substantial monetary credit. Through other CCR's, the government is obtaining a benefit in return for this relaxation of the requirements. The CCR's issued through this modification are all considered no-cost changes.

A handwritten signature in cursive script that reads "Sandra Marshall".

Sandra Marshall  
Contracting Officer

**GOES CONFIGURATION CHANGE REQUEST**CCR NUMBER: **4174**

REV:

PAGE 1

DATE ISSUED: **12/9/99****TITLE: SXI SAFE-TO-MATE / ELECTRICAL SIGNAL CHARACTERIZATION DURATION LIMIT**

ORIGINATOR MITCHELL

ORGANIZATION: 415

PH No: 301-286-0415

CLASS: 1 WAV/DEV/ECP/Other#:

CONTRACT No: NAS5- 98069

PRIORITY: **R** E=EMERGENCY, U=URGENT, R=ROUTINE**EFFECTIVITY**

Place an X in all affected instruments and/or spacecraft. (Interfaces MUST have both instrument and spacecraft included.)

SPACECRAFT		INSTRUMENT		IMAGER/SOUNDER SERIAL #s.	
GOES-I:	GOES-N: X	SOUNDER:	EPS:	S/N -01	S/N -08
GOES-J:	GOES-O: X	IMAGER:	HEPAD:	S/N -02	S/N -09
GOES-K:	GOES-P: X	SXI: X	XRS:	S/N -03	S/N -10
GOES-L:	GOES-Q: X	SEM:	MAGNETOMETER:	S/N -04	S/N -11
GOES-M:		EUV:		S/N -05	
OTHER:		OTHER:		S/N -06	
				S/N -07	

**1. DESCRIPTION OF CHANGE:**

(USE ATTACHMENTS IF NECESSARY)

Add to paragraph 3.4.4. of SOW S-415-23 as follows:

The SXI GFE instrument shall be allotted 20 hours for safe-to-mate/electrical signal characterization activities as defined in the SXI/Spacecraft GSE ICD. 20 hours shall be allotted for the SXI Engineering Model and each and every SXI Flight Model.

**2. REASON FOR CHANGE:**

(USE ATTACHMENTS IF NECESSARY)

HSC is in agreement to include revised safe-to-mate/electrical signal characterization into the GSE ICD (Ref. CCR 8024C). However, HSC wants to bound the amount of time spent on this activity to 20 hours.

**3. DOCUMENT(S) AFFECTED** (Indicate Paragraph Numbers, Pages, Tables, etc.)

DOCUMENT(S): S-415-23

PARAGRAPH/TABLE: 3.4.4

**4. CONTRACTOR REQUIRES AUTHORIZATION TO PROCEED BY:**PROCUREMENT CLASS: **R**

E=Emergency, U=Urgent, R=Routine, TD=Technical Direction, TA=Task Assignment, CO=CO Direction

EXPLAIN WHY  
THIS CCR IS AN  
EMERGENCY  
OR URGENT:



# GOES CONFIGURATION CHANGE REQUEST

CCR NUMBER: 4174

PAGE 2

Continued

DATE ISSUED: 12/9/99

TITLE: SXI SAFE-TO-MATE / ELECTRICAL SIGNAL CHARACTERIZATION DURATION LIMIT

## 5. IMPACT ANALYSIS: (If there is an impact, comment is required. Reference impact number.)

- |                     |                                 |
|---------------------|---------------------------------|
| 1. ATTITUDE CONTROL | 15. HARNESS                     |
| 2. FLIGHT SOFTWARE  | 16. TEST PROCEDURE              |
| 3. MATERIALS        | 17. INTERFACE                   |
| 4. RELIABILITY      | 18. SAFETY                      |
| 5. WEIGHT           | 19. LAUNCH VEHICLE              |
| 6. POWER            | 20. MISSION OPERATION           |
| 7. STRUCTURE        | 21. SCHEDULE EFFECT             |
| 8. TELEMETRY        | 22. ENGINEERING HOURS           |
| 9. COMMAND          | 23. MANUFACTURING COST          |
| 10. COMMUNICATION   | 24. MATERIAL COST               |
| 11. DATA HANDLING   | 25. OGE                         |
| 12. THERMAL         | 26. SYSTEM TEST AND INTEGRATION |
| 13. GSE             | 27. PROPULSION                  |
| 14. INSTRUMENT      | 28. PERFORMANCE                 |

IMPACT NUMBER(S):

## 6. IMPACT COMMENTS:

N/A

7. COST  
IMPACT?\*

NO

ESTIMATED COST:

8. SCHEDULE  
IMPACT?\*

NO

ESTIMATED HOURS:

\* If yes, In-house cost and schedule impact data must be provided.

## 9. CCB DIRECTION:



Approve



Disapprove



Withdraw



Level I

Approval

Required

PROJECT MANAGER CERTIFICATION: DATE:

NOAA CONCURRENCE:

DATE:

COMMENTS:

**GOES CONFIGURATION CHANGE REQUEST**

CCR NUMBER:

**18**

REV: C

DATE ISSUED:

**11/3/99**

PAGE 1

**TITLE: TELEMETRY NOMENCLATURE & REDUCED SURVIVAL TEMPERATURE**

ORIGINATOR CARPENTER (MELIS)

ORGANIZATION: LMSAL (415)

PH No: 650-424-2776 (301-286-8079)

CLASS: 1 WAV/DEV/ECP/Other#:

CONTRACT No: NAS5- 98069. 97181

PRIORITY: **R**

E=EMERGENCY, U=URGENT, R=ROUTINE

**EFFECTIVITY**

Place an X in all affected instruments and/or spacecraft. (Interfaces MUST have both instrument and spacecraft included.)

SPACECRAFT		INSTRUMENT		IMAGER/SOUNDER SERIAL #s.	
GOES-I:	GOES-N: <b>X</b>	SOUNDER:	EPS:	S/N -01	S/N -08
GOES-J:	GOES-O: <b>X</b>	IMAGER:	HEPAD:	S/N -02	S/N -09
GOES-K:	GOES-P: <b>X</b>	SXI: <b>X</b>	XRS:	S/N -03	S/N -10
GOES-L:	GOES-Q: <b>X</b>	SEM:	MAGNETOMETER:	S/N -04	S/N -11
GOES-M:		EUV:		S/N -05	
OTHER:		OTHER:		S/N -06	
				S/N -07	

**1. DESCRIPTION OF CHANGE:**

(USE ATTACHMENTS IF NECESSARY)

See block 1 of the attached LMSAL CCR 8018C.

**2. REASON FOR CHANGE:**

(USE ATTACHMENTS IF NECESSARY)

See block 2 of the attached LMSAL CCR 8018C.

**3. DOCUMENT(S) AFFECTED** (Indicate Paragraph Numbers, Pages, Tables, etc.)

DOCUMENT(S): ICD DS80667-H00-011 6/23/99

PARAGRAPH/TABLE: 2.2.2, 3.4.3.1, Tbl B-1, B-2, B-3

**4. CONTRACTOR REQUIRES AUTHORIZATION TO PROCEED BY:** 11/12/99**PROCUREMENT CLASS: R**

E=Emergency, U=Urgent, R=Routine, TD=Technical Direction, TA=Task Assignment, CO=CO Direction

**PLAIN WHY  
THIS CCR IS AN  
EMERGENCY  
OR URGENT:**

# GOES CONFIGURATION CHANGE REQUEST

CCR NUMBER: 8018 C

PAGE 2

Continued

DATE ISSUED: 11/3/99

TITLE: TELEMETRY NOMENCLATURE & REDUCED SURVIVAL TEMPERATURE

## 5. IMPACT ANALYSIS: (If there is an impact, comment is required. Reference impact number.)

- |                     |                                 |
|---------------------|---------------------------------|
| 1. ATTITUDE CONTROL | 15. HARNESS                     |
| 2. FLIGHT SOFTWARE  | 16. TEST PROCEDURE              |
| 3. MATERIALS        | 17. INTERFACE                   |
| 4. RELIABILITY      | 18. SAFETY                      |
| 5. WEIGHT           | 19. LAUNCH VEHICLE              |
| 6. POWER            | 20. MISSION OPERATION           |
| 7. STRUCTURE        | 21. SCHEDULE EFFECT             |
| 8. TELEMETRY        | 22. ENGINEERING HOURS           |
| 9. COMMAND          | 23. MANUFACTURING COST          |
| 10. COMMUNICATION   | 24. MATERIAL COST               |
| 11. DATA HANDLING   | 25. OGE                         |
| 12. THERMAL         | 26. SYSTEM TEST AND INTEGRATION |
| 13. GSE             | 27. PROPULSION                  |
| 14. INSTRUMENT      | 28. PERFORMANCE                 |

IMPACT NUMBER(S): 8, 11, 13, 14, 15, 17, 20, 26

## 6. IMPACT COMMENTS:

See block 6 of the attached LMSAL CCR 8018C.

## 7. COST IMPACT?\*

NO. NAS5-98069 Horse Trade?

ESTIMATED COST:

## 8. SCHEDULE IMPACT?\*

NO

ESTIMATED HOURS:

\* If yes, In-house cost and schedule impact data must be provided.

## 9. CCB DIRECTION:

- ☒ Approve  
☐ Disapprove  
☐ Withdraw

*Martin A. Davis* 12/23/99 *Thomas M. Krublewski* 12/23/99

PROJECT MANAGER CERTIFICATION: DATE:

NOAA CONCURRENCE:

DATE:

COMMENTS:

Level I  
Approval  
Required

Date: 03 November 1999

RECEIVED

NOV 03 1999

LMSAL SXI-99-1888C

Total Number of Pages: 5


**Geostationary Operational Environmental Satellite  
(GOES)**

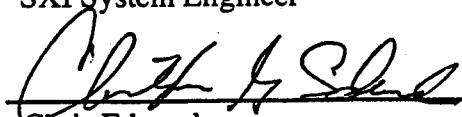
**Solar X-Ray Imager (SXI)**

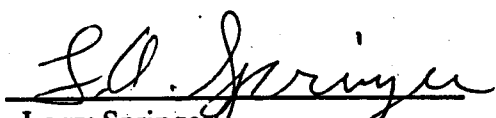
**Contract Change Request (CCR) 8018, Revision C**

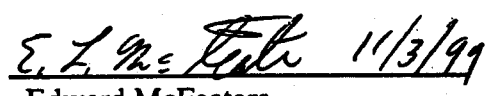
**Telemetry Nomenclature & Reduced Survival Temperature**

(affects SXI-S/C ICD)

  
Brock Carpenter, Originator  
SXI System Engineer

  
Chris Edwards  
APM Electrical Engineering

  
Larry Springer  
Program Manager

  
Edward McFeaters  
Mission Assurance

Prepared for: Goddard Space Flight Center  
National Aeronautics and Space Administration  
under Contract: NAS5-97181

Prepared by: Lockheed Martin Missiles & Space  
Advanced Technology Center — CAGE 65113  
Solar & Astrophysics Laboratory (LMSAL)  
3251 Hanover Street  
Palo Alto, CA 94304-1187

LOCKHEED MARTIN



**GOES CONFIGURATION CHANGE REQUEST**

CCR NUMBER: 8018C

DATE ISSUED: 03 November 1999

TITLE: Telemetry Nomenclature &amp; Reduced Survival Temperature

CLASS: 1	WAIVER:	DEVIATION:
ORIGINATOR: Brock Carpenter	CONTRACT NUMBER:	PRIORITY: R
ORGANIZATION: LMSAL	NAS5-97181	
PHONE NO: (650) 424-2776		E=EMERGENCY, U=URGENT, R=ROUTINE

**EFFECTIVITY**

Place an X in all affected instruments and/or spacecraft. (Interfaces MUST have both instrument and spacecraft included.)

GOES-I:	GOES-N: X	SOUNDER:	EPS:	S/N -01	S/N -08
GOES-J:	GOES-O: X	IMAGER:	HEPAD:	S/N -02	S/N -09
GOES-K:	GOES-P: X	SXI: X	XRS:	S/N -03	S/N -10
GOES-L:	GOES-Q: X		MAGNETOMETER:	S/N -04	S/N -11
GOES-M:				S/N -05	OTHER
OTHER:	OTHER:			S/N -06	OTHER
	Also applies to the SXI Engineering Model (EM)			S/N -07	OTHER

**1. DESCRIPTION OF CHANGE:**

The attached Appendix B change page reidentifies the nomenclature for all of the PCM SXI telemetry items Tables B-1, B-2, and B-3 of the ICD. As this change also affects the labeling of the Harness Drawing, incorporate FM Cable Harness SXI, drawing number 2A06603 Revision E, into the SXI Contractor Documents, paragraph 2.2.2 on page 6. A copy of 2A06603 Revision E is included with this CCR for information. Revision A of this CCR was already approved. Revision B of this CCR was withdrawn. Revision C of this CCR does not withdraw any of the changes approved in Revision A but adds a reference designator column to Table B-3 and updates the Harness drawing to add these designators. All changes to the Harness Drawing are noted in the revision block of that drawing.

To properly reference the temperature sensors in Table B-3,  
Change Req'd SXI3.4.3.1-4

**FROM:**

Telescope temperature sensors shall be located as shown in LMATC 2A06301.

**TO:**

Telescope temperature sensors (1SS, 2SS, 6SS, 7SS, & 8SS per Table B-3) shall be located as shown in LMATC 2A06301.

2) To correct the temperature range of the mirror assemble, Change Req'd SXI3.4.3.1-5:

**FROM:**

The SXI telescope survival temperature range shall be -10 deg C to +50 deg C.

**TO:**

The SXI mirror survival temperature range, as measured by the Mirror Temperature sensor (1SS per Table B-3), shall be -10 deg C to +43 deg C.

(use attachments if necessary)

**REASON FOR CHANGE:**

To comply with the HSC/GOES database requirements for telemetry mnemonics.  
To accommodate the SXI Mirror-Assembly allowable hardware limits.

(use attachments if necessary)

**GOES CONFIGURATION CHANGE REQUEST**

CCR NUMBER: 8018C

DATE ISSUED: 03 November 1999

TITLE: Telemetry Nomenclature &amp; Reduced Survival Temperature

3. DOCUMENT(S) AFFECTED: (Indicate Paragraph Numbers, Pages, Tables, etc.) — ONLY SXI DOCUMENTS ARE LISTED HERE —

## DOCUMENT(S):

Interface Control Document (ICD) Solar X-RAY Imager (SXI) Hughes GOES Satellite (N-O-P-Q),  
HSC Doc. No. DS80667-H00-011, dated June 23, 1999

PARAGRAPH/TABLE: Paragraph 2.2.2, 3.4.3.1, Tables B-1, B-2, &amp; B-3 of Appendix B

Attach change page(s)

4. CONTRACTOR REQUIRES AUTHORIZATION TO PROCEED BY:

November 12, 1999

PROCUREMENT CLASS: R, TD, CO

E=EMERGENCY, U=URGENT, R=ROUTINE, TD=TECHNICAL DIRECTION, TA=TASK ASSIGNMENT, CO=CONTRACTING OFFICER DIRECTION

EXPLAIN WHY:

(USE ATTACHMENTS IF NECESSARY)

5. IMPACT ANALYSIS: (If there is an impact, comment is required. Reference impact number.)

- |                     |                                 |
|---------------------|---------------------------------|
| 1. ATTITUDE CONTROL | 15. HARNESS                     |
| 2. FLIGHT SOFTWARE  | 16. TEST PROCEDURE              |
| 3. MATERIALS        | 17. INTERFACE                   |
| 4. RELIABILITY      | 18. SAFETY                      |
| 5. WEIGHT           | 19. LAUNCH VEHICLE              |
| 6. POWER            | 20. MISSION OPERATION           |
| 7. STRUCTURE        | 21. SCHEDULE EFFECT             |
| 8. TELEMETRY        | 22. ENGINEERING HOURS           |
| 9. COMMAND          | 23. MANUFACTURING COST          |
| 10. COMMUNICATION   | 24. MATERIAL COST               |
| 11. DATA HANDLING   | 25. OGE                         |
| 12. THERMAL         | 26. SYSTEM TEST AND INTEGRATION |
| 13. GSE             | 27. PROPULSION                  |
| 14. INSTRUMENT      | 28. PERFORMANCE                 |

IMPACT NUMBER(S): 8, 11, 13, 14, 15, 17, 20, and 26

## 6. IMPACT COMMENTS:

The SXI contractor proposes no change in cost or schedule if this CCR is approved, as submitted, by the date needed (see block 4).

Impacts to contractors/agencies other than Lockheed Martin's, e.g. HSC, are believed to be negligible should this CCR be approved expeditiously.

7. IS THERE COST IMPACT? - No

IS THERE SCHEDULE IMPACT? No

ESTIMATED COST: \_\_\_\_\_

ESTIMATED HOURS: \_\_\_\_\_

If yes, in-house cost impact and schedule impact data must be attached.

## 8. GOES CONFIGURATION MANAGEMENT OFFICE

SUBMIT FOR CCB REVIEW

SUBMIT FOR TO PM; BYPASS CCB

CM OFFICE (INITIAL)

Old page from Appendix B (WAS):

**Table B-1. SXI Analog Telemetry**

PARAMETER	SAMPLING RATE (Seconds)	CHANNEL NAME
SXI Motor Current Monitor	16.384	XMDTCUR
SXI +3V Power Supply Voltage	16.384	XP3VPWR
SXI 42V Input Current	16.384	XINPCUR

**Table B-2. SXI Discrete (Type A) Telemetry**

PARAMETER	SAMPLING RATE (Seconds)	CHANNEL NAME
SXI Discrete-1	8.192	XBILEVA
SXI Discrete-2	8.192	XBILEVB
SXI Discrete-3	8.192	XBILEVC
SXI Discrete-4	8.192	XBILEVd

**Table B-3. SXI Temperature Telemetry**

PARAMETER	SAMPLING RATE (Seconds)	SENSOR TYPE	CHANNEL NAME
Mirror Temperature	32.768 +/-1ms	THERMISTOR 6G07-4	HXMIRTMP
CCD Header Temperature	32.768 +/-1ms	PRT 6G11-4	HXCCDTMP
DEB Internal Temperature	32.768 +/-1ms	THERMISTOR 6G07-4	HXDEBTMP
PEB Internal Temperature	32.768 +/-1ms	THERMISTOR 6G07-4	HXPEBTMP
CEB Temp	32.768 +/-1ms	6G07-4	HXCEBTMP
Telescope Support #1	32.768 +/-1ms	6G07-4	HXMNTMPA
Telescope Support #2	32.768 +/-1ms	6G07-4	HXMNTMPB
HEB Temp	32.768 +/-1ms	6G07-4	HXHASTMP

Change Page for Appendix B (IS):

---

**Table B-1. SXI Analog Telemetry**

PARAMETER	SAMPLING RATE (sec)	CHANNEL NAME
SXI Motor Current Monitor	16.384	SXI_PCM_MTRCURMON
SXI +3V Power Supply Voltage	16.384	SXI_PCM_DEBP3MON
SXI +42V Input Current	16.384	SXI_PCM_P42CURMON

**Table B-2. SXI Discrete (Type A) Telemetry**

PARAMETER	SAMPLING RATE (sec)	CHANNEL NAME
CPU booted and on-line (SXI Discrete-1)	8.192	SXI_PCM_ONLINE
Watchdog indicator for software main-loop (SXI Discrete-2)	8.192	SXI_PCM_WATCHDOG
Command error detected (SXI Discrete-3)	8.192	SXI_PCM_CMD_ERR
Telemetry error detected (SXI Discrete-4)	8.192	SXI_PCM_TLM_ERR

**Table B-3. SXI Temperature Telemetry**

REFERENCE DESIGNATION	PARAMETER	SAMPLING RATE (sec)	SENSOR TYPE	CHANNEL NAME
1SS	Mirror Temperature	32.768 +/-1ms	Thermistor 6G07-4	SXI_PCM_MIRTMP
2SS	CCD Header Temperature	32.768 +/-1ms	PRT 6G11-4	SXI_PCM_CCDTMP
3SS	PEB Internal Temperature	32.768 +/-1ms	Thermistor 6G07-4	SXI_PCM_PEBTMP
4SS	DEB Internal Temperature	32.768 +/-1ms	Thermistor 6G07-4	SXI_PCM_DEBTMP
5SS	HEB Temperature	32.768 +/-1ms	Thermistor 6G07-4	SXI_PCM_HEBTMP
6SS	CEB Temperature	32.768 +/-1ms	Thermistor 6G07-4	SXI_PCM_CEBTMP
7SS	Telescope Support #1	32.768 +/-1ms	Thermistor 6G07-4	SXI_PCM_TELMNT1
8SS	Telescope Support #2	32.768 +/-1ms	Thermistor 6G07-4	SXI_PCM_TELMNT2



<b>AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE N/A	PAGE OF 1   3
2. AMENDMENT/MODIFICATION NO. Thirty-Five (35)	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. See Block 12	5. PROJECT NO. (If applicable)
ISSUED BY NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		7. ADMINISTERED BY (If other than Item 6) CODE NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE	FACILITY CODE
(X) 9A. AMENDMENT OF SOLICITATION NO.	9B. DATED (SEE ITEM 11)
X 10A. MODIFICATION OF CONTRACT/ORDER NO. NASS-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Clause 52.243-1 Changes Fixed Price—Alt. II
	d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract price by \$24,471 for proposal preparation costs associated with Configuration Change Request 4157B and adds a performance based payment event. It also increases the contract funding by \$25,000,000.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J.T. Felicita Manager, NASA Contracts	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall
15B. CONTRACTOR/OFFEROR J.T. Felicita (Signature of person authorized to sign)	15C. DATE SIGNED 3/9/2000
16B. UNITED STATES OF AMERICA BY Sandra Marshall (Signature of Contracting Officer)	16C. DATE SIGNED 3/13/00

1. In Clause B.1 DELIVERABLE REQUIREMENTS, increase the amount of Contract Line Item Number 1, On-Orbit Acceptance of GOES N Spacecraft, to \$275,094,471.

2. Increase Clause B.2 FIRM FIXED PRICE as follows:

<u>From</u>	<u>By</u>	<u>To</u>
\$423,570,000	\$24,471	\$423,594,471

3. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, add the following event:

N75. Safehold Mode Proposal      \$ 24,471      3/15/00

4. In Clause H.6, increase the funding by \$25,000,000 to \$184,128,313. The period of allotment is from the effective date of the contract through August 16, 2000.

5. Block 12 Accounting and Appropriation Data, of page 1:

PCN: 415-52560A(1C)	415-52571A(1C)
JON: 415-616-41-81-11	415-616-41-81-11
APP: 800/10110(00)	800/10110(00)
BLI: A701	A702
OC: 41-2550	41-2550
AMT: \$25,333	\$24,974,667

6. In Clause J.1 LIST OF ATTACHMENTS, make the following change:

Attachment K, Performance Based Payments Completion Criteria

Add item N75 Safehold Mode Proposal with a completion criteria of 6.

7. Replace the contract areas listed below with the enclosed revised pages:

Contract

Page 4  
Page 6  
Page 14  
Page 15  
Page 48  
Page 49

Attachment K, Performance Based Payments Completion Criteria

Page 4

This modification represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change specified in Block 14 of Page 1.

END OF MODIFICATION

**SECTION B OF NAS5-98069  
MODIFICATION NO. 35  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.1 DELIVERABLE REQUIREMENTS (GSFC 52.210-90) (OCT 1988)**

The Contractor shall perform and/or deliver the following:

<u>Contract Line Item Number (CLIN)</u>	<u>Description</u>	<u>Price</u>
1.	On-Orbit Acceptance of GOES N Spacecraft	\$275,094,471
2.	Propulsion Computer Model & Supporting Documentation	NSP
3.	Software Development & Validation Environment GTACS Workstation for SXI T&C, I&V and Software Development	NSP
4.	Source & Executable Flight Software Code	NSP
5.	Emulators S/C Emulator (2)	NSP
6.	INR Performance Evaluation System	NSP
7.	SXI to Spacecraft Harness	NSP
8.	Battery Test Cells (5 from each activation lot)	NSP
9.	Data for Communication Modeling Engineering Model Data Flight Model Data	NSP
10.	Acceptance of SSGS	NSP
11.	On-Orbit Acceptance of GOES O Spacecraft	\$148,500,000

**SECTION B OF NAS5-98069  
MODIFICATION NO. 35  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.2 FIRM FIXED PRICE (18-52.216-78) (DEC 1988)**

The total firm fixed price for this contract is \$423,594,471.

(End of clause)

**B.3 RESERVED**

**B.4 PERFORMANCE-BASED PAYMENTS (52.232-32) (MAY 1997)**

(a) Amount of payments and limitations on payments. Subject to such other limitations and conditions as are specified in this contract and this clause, the amount of payments and limitations on payments shall be specified in the contract's description of the basis for payment.

(b) Contractor request for performance-based payment. The Contractor may submit requests for payment of performance-based payments not more frequently than monthly, in a form and manner acceptable to the Contracting Officer. Unless otherwise authorized by the Contracting Officer, all performance-based payments in any period for which payment is being requested shall be included in a single request, appropriately itemized and totaled. The Contractor's request shall contain the information and certification detailed in paragraphs (l) and (m) of this clause.

(c) Approval and payment of requests. (1) The Contractor shall not be entitled to payment of a request for performance-based payment prior to successful accomplishment of the event or performance criterion for which payment is requested. The Contracting Officer shall determine whether the event or performance criterion for which payment is requested has been successfully accomplished in accordance with the terms of the contract. The Contracting Officer may, at any time, require the Contractor to substantiate the successful performance of any event or performance criterion which has been or is represented as being payable.

(2) A payment under this performance-based payment clause is a contract financing payment under the Prompt Payment clause of this contract, and approved requests shall be paid in accordance with the prompt payment period and provisions specified for contract financing payments by that clause. However, if the Contracting Officer requires substantiation as provided in paragraph (c)(1) of this clause, or inquires into the status of an event or performance criterion, or into any of the conditions listed in paragraph (e) of this clause, or into the Contractor certification, payment is not required, and the prompt payment period shall not begin until the Contracting Officer approves the request.

(3) The approval by the Contracting Officer of a request for performance-based payment does not constitute an acceptance by the Government and does not excuse the Contractor from

**SECTION B OF NAS5-98069  
MODIFICATION NO. 35  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**Contractor Defined Milestones**

N41.	GOES N and O Team Kickoff	\$1,000,000	2/11/98
N42.	Contract Award to Panametrics for SEM Instruments	\$3,000,000	3/4/98
N43.	Deliver Engineering Communications Model Data	\$8,000,000	10/7/98
N44.	S/C Emulator & PES PDR	\$8,000,000	11/3/98
N45.	Gate 3 - GOES Bus Layout Complete	\$7,500,000	12/11/98
N46.	Gate 5 - GOES Antenna Design Complete	\$6,000,000	12/23/98
N47.	RESERVED		
N48.	GTACS/NTACTS Proof-of-Concept Demo	\$5,500,000	2/15/99
N49.	Gate 4 - GOES Payload Layout Complete	\$6,500,000	2/19/99
N50.	Communication Subsystem CDR	\$3,500,000	3/10/99
N51.	RESERVED		
N52.	Version Description Document - Build 4	\$3,500,000	6/18/99
N53.	RESERVED		
N54.	Deliver Flight Communications Model Data	\$3,000,000	9/8/99
N55.	Gate 7 - Start Bus Integration	\$6,000,000	11/25/99
N56.	Deliver Ground System SOCC/CDASS	\$2,600,000	3/23/00
N57.	Gate 9 - Bus Complete	\$2,000,000	3/24/00
N58.	GOES N End-to-End Test 1A Completed	\$2,500,000	6/23/00
N59.	Flight Operations Training Program Completed	\$10,000,000	10/4/00

**SECTION B OF NAS5-98069  
MODIFICATION NO. 35  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N60.	Spacecraft Training Program Plan (Final)	\$8,000,000	11/28/00
N61.	Complete Fit Check	\$8,000,000	12/1/00
N62.	GOES N End-to-End Test 2 Completed	\$4,000,000	1/26/01
N63.	Launch Site Test Procedures	\$4,000,000	3/19/01
N64.	INR System Description and Analysis Document (Final)	\$4,000,000	4/27/01
N65.	Contingency Simulation # 1	\$4,000,000	8/2/02
N66.	Dress Rehearsal	\$3,000,000	9/13/02
N67.	GOES-N Data Book	\$10,000,000	10/08/00
N68.	GOES-N End-to-End Test 4 Completed	\$3,000,000	5/14/01
N69.	Algorithm Design Description – Build 3	\$4,000,000	1/20/99
N70.	1553 Data Bus Diagnostics Features Meeting	\$2,000,000	2/11/99
N71.	PES ADD Walk-Thru Review	\$2,000,000	7/15/99
N72.	PES Prototype GUI Demo	\$2,000,000	7/15/99
N73.	PES Delivery	\$500,000	10/15/99
N74.	Wideband Tape Recorder Delivery & Training	\$470,000	3/31/00
N75.	Safehold Mode Proposal	\$24,471	3/15/00

**GOES O**

**Spacecraft System Level Reviews**

O1.	Critical Design Review	\$2,000,000	2/11/00
O2.	Mission Operations Review	\$10,000,000	4/2/02
O3.	Pre-Environmental Review	\$10,000,000	4/18/02
O4.	Pre-Storage Review	\$12,000,000	12/11/02
O4A.	Pre-Shipment Review	\$1,000,000	12/11/03
O5.	Flight Operations Review	\$1,000,000	1/9/04
O6.	Spacecraft Launch Readiness Review	\$1,000,000	4/4/04

**SECTION H OF NAS5-98069  
MODIFICATION NO. 35  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$184,128,313 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:



**SECTION H OF NAS5-98069  
MODIFICATION NO. 35  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until August 16, 2000.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

**GOES N**

N68.	GOES N End-to-End Test 4 Completed	6
N69.	Algorithm Design Description – Build 3	6
N70.	1553 Data Bus Diagnostics Features Meeting	6
N71.	PES ADD Walk-Thru Review	1
N72.	PES Prototype GUI Demo	6
N73.	PES Delivery	4
N74.	Wideband Tape Recorder Delivery & Training	6
N75.	<b>Safehold Mode Proposal</b>	<b>6</b>

**GOES O**

Milestone	Description	Completion Criteria
O29.	Gate 7 - Start Bus Integration	5
O30.	Gate 9 - Bus Complete	5
O31.	Gate 10 - Payload Complete	5
O32.	Bus & SEM Instruments Integration & Test Complete	6
O33.	XRS/EUV/EPS/HEPAD Flight Unit#2 (N-O Spares) Pre-Shipment Review	1
O34.	Gate 12 - GOES O S/C to System Test	5
O35.	Gate 13 - GOES O S/C Complete	5
O36.	GOES O End-to-End Test 4 Completed	6

**GOES P**

Milestone	Description	Completion Criteria
P29.	Kickoff Meeting	1
P30.	Deliver Launch Services Proposal	3
P31.	Manufacturing Readiness Review	1
P32.	Preliminary Design Review (If req'd)	1
P33.	Transfer SEM instruments from precontractual stores	6
P34.	Communication Subsystem to Integration	6
P35.	T&C Subsystem to Integration	6
P36.	Gate 11 - Antenna to Integration	5
P37.	ACS Subsystem to Integration	6
P38.	Gate 9 - Bus Complete	5
P39.	Bus & SEM Instruments Integration & Test Complete	6
P40.	S/C Unit Integration Complete	6

**GOES P**

P41.	SEM Instruments Integration & Test	6
P42.	Gate 12 - S/C to System Test	5
P43.	GFE Integration	6
P44.	Complete EMI/EMC Test	6

**GOES Q**

Milestone	Description	Completion Criteria
Q29.	Kickoff Meeting	1
Q30.	Deliver Launch Services Proposal	3
Q31.	Manufacturing Readiness Review	1
Q32.	Preliminary Design Review (If req'd)	1
Q33.	Transfer SEM instruments from precontractual stores	6
Q34.	Communication Subsystem to Integration	6
Q35.	T&C Subsystem to Integration	6
Q36.	Gate 11 - Antenna to Integration	5
Q37.	ACS Subsystem to Integration	6
Q38.	Gate 9 - Bus Complete	5
Q39.	Bus & SEM Instruments Integration & Test Complete	6
Q40.	S/C Unit Integration Complete	6
Q41.	SEM Instruments Integration & Test	6
Q42.	Gate 12 - S/C to System Test	5
Q43.	GFE Integration	6
Q44.	Complete EMI/EMC Test	6

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 7

2. AMENDMENT/MODIFICATION NO.

Thirty-Six (36)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center

GOES Procurement Office, Code 214.2

Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and

DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.

PO Box 92919

Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.

NAS5-98069

10B. DATED (SEE ITEM 13)

01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

Clause 52.243-1 Changes Fixed Price—Alt. II

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor

☐ is not,☒ is required to sign this document and return

3

copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4086, 4175B, 4182B, 4183C, 4184, 4187, 6035A, 6036A, 6037A, 6039, 6040A, 6042, 6043, 6044B, 6047A, 6049, 6054B, 6056, 6058, 6061A, 7029, and 7031, at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J. T. Felicitia  
Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

J. T. Felicitia  
(Signature of person authorized to sign)

5/11/00

BY Sandra Marshall  
(Signature of Contracting Officer)

5/16/00

GSA FPMR (41 CFR) 101-11.6

30-105

STANDARD FORM 30 (Rev. 10-83)

PREVIOUS EDITION UNUSABLE

Prescribed by GSA

**1. In Clause B.1 DELIVERABLE REQUIREMENTS, revise item #5 to read as follows:**

5. Emulators w/Spare Parts NSP  
S/C Emulator (2)  
3 sets EACE components (1 set includes EACE board,  
EACE DPM daughter card, EACE PAM board;  
3 sets ETC components (1 set includes ETC board and  
PAM board;  
2 special order ovenized oscillators used by EACE

**2. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, make the following changes:**

Increase N6A, Pre-Shipment Review, from \$2,000,000 to \$5,500,000.  
Decrease N31, Launch Vehicle Mission Peculiar/Mission Unique Critical Design Review, from \$4,000,000 to \$500,000 and change the date to 9/15/01.  
Increase O17, Launch Vehicle Pre-Ship Review from \$2,000,000 to \$2,500,000.  
Decrease O21 Launch Vehicle Mission Peculiar/Mission Unique Critical Design Review, from \$1,000,000 to \$500,000 and change the date to 3/15/03.

**3. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment A, Statement of Work

Add the following:

**3.4.5.2 Visual Monitoring of Imager and Sounder Louvers during Thermal Vacuum Testing**

The spacecraft contractor shall provide the capability to visually monitor the Imager and Sounder louvers during spacecraft level thermal vacuum testing, using two CCTV cameras, two monitors and two VCR's, (all provided by the spacecraft contractor). The spacecraft contractor shall provide a fixed mount and mount the two CCTV cameras inside the TV chamber, with an acceptable view of the Imager and Sounder Louvers. A location shall be provided external to the chamber, for viewing the television monitors. Electrical power along with cables, TV chamber feedthroughs, and thermal control (heaters/MLI) to maintain the CCTV cameras within an acceptable operating temperature range, shall be provided and installed.

Attachment B, Performance Specification

In paragraph 3.4 correct the resistivity-thickness product to read  $rt < 2 \times 10E9$  ohm-cmE2.

In paragraph 6.2.2 change item 5 to read as follows:

"5. Magnetometer - turn on the instrument before deploying the magnetometer boom. See section 9.1.1 for requirements pertaining to on-orbit zero offset determination and calibration. Magnetometer turn-on and deployment shall occur after orbit raising activities are completed and before handover."

In paragraph 7.2.1 replace item 15a-h with the following:

"15. Use the GOES I-M Archive System for the on-line storage of the GOES N-Q DSN and CDA (2209 MHz and 1694 MHz) PCM telemetry streams, NTACTS AGC data, Imager and Sounder wideband telemetry received from the SPS, and SXI data received from the MRS&S. The interface between GTACS and the GOES I-M archive system shall be in accordance with the GOES N-Q GTACS to GOES I-M Archive System ICD TBD.

In paragraph 7.2.1, add the following to the end of item 19a:

"These timing requirements take effect upon receipt by the trending/analysis process of the requested archive data."

Change paragraph 9.1.1.9 to read as follows:

"The effective magnetometer sensor offset (sensor plus spacecraft) shall be determined on-orbit via a spacecraft rotation maneuver. The determination shall be made during the spacecraft post-launch test period in the vicinity of local noon."

Change paragraph 9.5.5 to read as follows:

"The spacecraft shall process and distribute commands to the IOO. One serial and six pulse command channels shall be provided to each IOO (one or two instruments)."

Change paragraph 9.5.6.1 to read as follows:

"The spacecraft shall transmit the 100 kbps, NRZ-L formatted IOO data stream continuously to the ground via the MDL. If two instruments of opportunity are installed, the aggregate data rate from both instruments shall not exceed 100 kbps. Additionally, the data rate from IOO #2 shall not exceed 50 kbps."

Add the following paragraph:

"9.5.6.1.1 Science Data Electrical Interface - The spacecraft shall be capable of processing up to two (2) separate science data output streams from the Instrument of Opportunity set, at the combined data rate specified in section 9.5.6.1. Each of the two data streams shall consist of two separate data and clock signals and these signals shall have the following electrical characteristics:

1. Signal Format: NRZ-L
2. Signal Type: EIA-RS-422

Change paragraph 9.5.6.2 to read as follows:

"The spacecraft shall sample IOO telemetry and include the data in the spacecraft telemetry (PCM) downlink. The spacecraft shall provide one 8-bit analog and nine 8-bit passive (conditioned) analog channels, each sampled at a minimum rate of 0.05 Hz, in the spacecraft telemetry (PCM) format."

Change paragraph 10.2.3 to read as follows:

"The MDL transmission channel shall multiplex the Imager Servo Error, the Imager IMC Analog data, Sounder Servo Error, SXI data, Imager ADS, SXI ADS, IOO data (from one or two instruments), normal mode Telemetry, and Dwell mode Telemetry and any other contractor specified data. The output data shall be NRZ-L formatted and shall include at a minimum a parity bit in the header to allow for bit error detection. This data stream shall then be balanced QPSK modulated. Refer to the Imager, Sounder, SXI Interface Control Documents (ICDs), and the IRD for the IOO for data rate and data format information. The spacecraft contractor shall format the data stream to resolve the four-fold phase ambiguity of the demodulated data. The MDL transmission channel shall also have a ground commandable mode in which the downlink carrier is QPSK modulated only by a PN sequence for use in BER testing. Furthermore, the MDL transmission channel shall have a ground commandable mode through which a CW RF carrier can be emitted for EIRP and long-term frequency stability testing."

Change paragraph 10.2.9.4.2 to read as follows:

"The transponder modulation index shall be such as to provide between 2 and 5 dB of carrier suppression on orbit and the carrier suppression shall remain within  $\pm 0.25$  dB over any 20 minute interval, with the noise power as seen on orbit, in all transponder commandable modes and configurations. The spacecraft contractor shall analytically determine the system temperature difference (the ambient channel noise power difference) between the on-orbit environment and the integration and test environment. There shall be no measurable spurious modulation of the SAR repeater due to the operation of any spacecraft function as measured at the transponder input that exceeds -175dBmi."

Change paragraph 10.5.2 to read as follows:

"The spacecraft shall be capable of connecting and disconnecting each load individually by command. Essential or critical loads may be hard-wired to the spacecraft bus. It shall be impossible to disconnect or otherwise disable the command function. Some short-term current sharing with the battery for selected peak power conditions is allowed if approved by NASA."

Paragraph 10.11.3 allows for the deviation of Fiberdux glass epoxy laminate used in the SAAB S-Band Omni Antenna as reflected in CCR 6058.

Add Appendix C, Exemptions to Reference Documents which pertains to paragraph 2.0 of the Performance Specification. The exemptions agreed to on this modification are reflected in CCR's 6035A, 6036A, 6037A, 6039, 6040A and 6042.

#### Attachment C, GOES N-Q Imager Interface Control Document

Change paragraph 3.5.4.3.2, figure 3.5.4-6 and table 3.5.4-8, in accordance with CCR 7031, to reflect changing the timing of the Scan Mirror Position Data update from the falling edge of the Strobe clock to the rising edge.

Revise paragraphs 1, 2.3 and 5.4 to reflect the change from 26 AWG wire in the Imager harness to 30 AWG wire and to define the harness interface as reflected in CCR 6056.

#### Attachment D, N-Q Sounder Instrument Interface Control Document

Change table 3.4.1-2 to reflect the harness lengths in CCR 6047A.

Change paragraph 3.5.4.3.2, figure 3.5.4-6 and table 3.5.4-8, in accordance with CCR 7031, to reflect changing the timing of the Scan Mirror Position Data update from the falling edge of the Strobe clock to the rising edge.

In table 5.1.1-1 change the description for Word 12, Bit(s) 6-15 to N-S Increments (Low Byte).

Revise paragraphs 1, 2.3 and 5.4 to reflect the change from 26 AWG wire in the Sounder harness to 30 AWG wire and to define the harness interface as reflected in CCR 6056.



Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

In table 3-26, change the specification of the SXI synchronization pulse as reflected in CCR 6061A.

Attachment H, List of Government Furnished Property

Change the availability date of the SXI Engineering Model to July 8, 2000.

**4. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 4  
Page 5  
Page 11  
Page 13  
Page 16  
Page 17

Statement of Work

Paragraph 3.4.5.2

Performance Specification

Paragraph 2.0  
Paragraph 3.4  
Paragraph 6.2.2, item 5  
Paragraph 7.2.1, item 15 and 19(a)  
Paragraph 9.1.1.9  
Paragraph 9.5.5  
Paragraph 9.5.6.1  
Paragraph 9.5.6.1.1  
Paragraph 9.5.6.2  
Paragraph 10.2.3  
Paragraph 10.2.9.4.2  
Paragraph 10.5.2  
Paragraph 10.11.3

Appendix A - Waiver Listing  
Appendix C - Exemptions to Reference Documents

List of Government Furnished Property

3 pages

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**SECTION B OF NAS5-98069  
MODIFICATION NO. 36  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.1 DELIVERABLE REQUIREMENTS (GSFC 52.210-90) (OCT 1988)**

The Contractor shall perform and/or deliver the following:

<u>Contract Line Item Number (CLIN)</u>	<u>Description</u>	<u>Price</u>
1.	On-Orbit Acceptance of GOES N Spacecraft	\$275,094,471
2.	Propulsion Computer Model & Supporting Documentation	NSP
3.	Software Development & Validation Environment GTACS Workstation for SXI T&C, I&V and Software Development	NSP
4.	Source & Executable Flight Software Code	NSP
5.	Emulators w/Spare Parts S/C Emulator (2) 3 sets EACE components (1 set includes EACE board, EACE DPM daughter card, EACE PAM board; 3 sets ETC components (1 set includes ETC board and PAM board; 2 special order ovenized oscillators used by EACE	NSP
6.	INR Performance Evaluation System	NSP
7.	SXI to Spacecraft Harness	NSP
8.	Battery Test Cells (5 from each activation lot)	NSP
9.	Data for Communication Modeling Engineering Model Data Flight Model Data	NSP
10.	Acceptance of SSGS	NSP

**SECTION B OF NAS5-98069  
MODIFICATION NO. 36  
SUPPLIES OR SERVICES AND PRICES/COSTS**

- |     |   |                |
|-----|---|----------------|
| 11. | On-Orbit Acceptance of<br>GOES O Spacecraft | \$148,500,000  |
| 12. | Special Task Assignments<br>with Reports    | See Clause B.9 |
| 13. | Additional Integration &<br>Testing Support | See Clause H.4 |
| 14. | Spacecraft Storage                          | See Clause H.4 |

**OPTION 1**

- |     |   |                |
|-----|---|----------------|
| 15. | On-Orbit Acceptance of<br>GOES P Spacecraft | \$190,900,000  |
| 16. | Special Task Assignments<br>with Reports    | See Clause B.9 |
| 17. | Additional Integration &<br>Testing Support | See Clause H.4 |
| 18. | Spacecraft Storage                          | See Clause H.4 |

**OPTION 2**

- |     |   |                |
|-----|---|----------------|
| 19. | On-Orbit Acceptance of<br>GOES Q Spacecraft | \$185,000,000  |
| 20. | Special Task Assignments<br>with Reports    | See Clause B.9 |
| 21. | Additional Integration &<br>Testing Support | See Clause H.4 |
| 22. | Spacecraft Storage                          | See Clause H.4 |

Total value of each CLIN, for purposes of final payment shall be reduced by Performance Based Payments made to the contractor for that CLIN.

(End of clause)

**SECTION B OF NAS5-98069  
MODIFICATION NO. 36  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS**

In accordance with Clause B.4 PERFORMANCE BASED PAYMENTS (52.232-32), and upon successful completion of an event, as defined in B.6 DETERMINATION OF EVENT COMPLETION, the contractor may request performance based payments based for the following Events: (Requests for payment for milestones completed in September after the September request for payment has been submitted and milestones completed in October, will be submitted in November)

<u>Event No.</u>	<u>Event</u>	<u>Amount</u>	<u>Date</u>
<u>GOES N</u>			
Spacecraft System Level Reviews			
N1.	System Concept Review	\$3,750,000	5/5/98
N2.	Preliminary Design Review	\$1,500,000	8/13/98
N2A.	Preliminary Design Review Updates	\$1,000,000	12/20/98
N3.	Critical Design Review	\$6,500,000	5/13/99
N4.	Mission Operations Review	\$2,400,000	5/12/00
N5.	Pre-Environmental Review	\$11,000,000	9/19/00
N6.	Pre-Storage Review	\$4,000,000	5/21/01
N6A.	Pre-Shipment Review	\$5,500,000	5/21/02
N7.	Flight Operations Review	\$4,000,000	6/6/02
N8.	Spacecraft Launch Readiness Review	\$2,000,000	10/5/02
Software Subsystem Reviews			
N9.	Concept Review	\$3,000,000	3/5/98
N10.	Requirements Review	\$2,500,000	5/7/98
N11.	Preliminary Design Review	\$1,000,000	7/9/98

**SECTION B OF NAS5-98069  
MODIFICATION NO. 36  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N28.	Booster on Stand (BOS) Review	\$3,500,000	8/7/02
N29.	Pre-Payload Mate Review	\$3,000,000	9/20/02
N30.	Launch Vehicle Mission Peculiar/ Mission Unique Preliminary Design Review	\$1,000,000	4/13/99
N31.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$500,000	9/15/01
N32.	RESERVED		
N33.	Baseline Delta 3 Design TIM Data Package and Presentation at CCAS	\$1,000,000	3/12/99
N34.	External Independent Readiness Review	\$4,000,000	8/15/02
N35.	Senior NASA Management Mission Readiness Review	\$3,000,000	9/10/02
N36.	Launch Readiness Review	\$2,000,000	10/1/02

**Electronic Data Distribution System**

N37.	EDDS Critical Design Review	\$2,000,000	5/13/98
N37A	EDDS Hardware/Software Interface Review	\$3,500,000	4/13/98
N38.	EDDS Acceptance	\$ 500,000	7/28/98

**System Events**

N39.	Spacecraft Engineering Handover	\$7,000,000	10/31/02
N40.	Final On-orbit Acceptance	\$4,000,000	4/30/03

**SECTION B OF NAS5-98069**  
**MODIFICATION NO. 36**  
**SUPPLIES OR SERVICES AND PRICES/COSTS**

**Software Subsystem Reviews**

O7.	Critical Design Review	\$4,500,000	9/27/99
O8.	Test Readiness Review	\$3,000,000	1/3/00
O9.	Acceptance Review	\$2,000,000	3/13/00

**Launch Services**

O10.	Launch Vehicle Interface Requirements Document	\$2,500,000	12/20/99
O11.	Spacecraft/Launch Vehicle Interface Control Document	\$2,100,000	1/27/00
O12.	Mission Integration Program Kickoff Review	\$2,500,000	8/11/99
O13.	Final Loads Verification Review	\$10,000,000	5/30/02
O14.	Launch Vehicle Requirements Review	\$5,000,000	12/16/99
O15.	Launch Vehicle Pre-Installation Review (Major Components)	\$11,500,000	8/19/03
O16.	Launch Vehicle Design Certification Review	\$1,000,000	2/5/04
O17.	Launch Vehicle Pre-Ship Review	\$2,500,000	10/10/03
O18.	Booster on Stand (BOS) Review	\$1,000,000	2/5/04
O19.	Pre-Payload Mate Review	\$1,000,000	3/18/04
O20.	Launch Vehicle Mission Peculiar/ Mission Unique Preliminary Design Review	\$2,000,000	1/11/00

**SECTION B OF NAS5-98069  
MODIFICATION NO. 36  
SUPPLIES OR SERVICES AND PRICES/COSTS**

O21.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$500,000	3/15/03
O22.	RESERVED		
O23.	RESERVED		
O24.	External Independent Readiness Review	\$1,000,000	2/12/04
O25.	Senior NASA Management Mission Readiness Review	\$1,000,000	3/10/04
O26.	Launch Readiness Review	\$1,000,000	3/31/04

**System Events**

O27.	Spacecraft Engineering Handover	\$2,000,000	4/30/04
O28.	Final On-orbit Acceptance	\$1,000,000	9/24/04

**Contractor Defined Milestones**

O29.	Gate 7 - Start Bus Integration	\$1,900,000	2/11/00
O30.	Gate 9 - Bus Complete	\$1,000,000	8/24/00
O31.	Gate 10 - Payload Complete	\$4,000,000	1/16/01
O32.	Bus & SEM Instruments Integration & Test Complete	\$13,000,000	1/16/01
O33.	XRS/EUV/EPS/HEPAD Flight Unit #2 (N-O Spares) Pre-Shipment Review	\$10,500,000	12/07/01
O34.	Gate 12 - GOES O S/C to System Test	\$10,000,000	4/03/02
O35.	Gate 13 - GOES O S/C Complete	\$12,000,000	1/07/03
O36.	GOES-O End-to-End Test 4 Completed	\$2,000,000	12/05/02



AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 3

2. AMENDMENT/MODIFICATION NO.

Thirty-Seven (37)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

6. ISSUED BY CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6) CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.

NAS5-98069

10B. DATED (SEE ITEM 13)

01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

PC: BX B/NC: 427 N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

Clause 52.243-1 Changes Fixed Price—Alt. II

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor

☐ is not,☒ is required to sign this document and return

3

copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4189B, 4190, 4196, 6006C and 8022A at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J. T. Felicita  
Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

J. T. Felicita  
(Signature of person authorized to sign)

15C. DATE SIGNED

5/15/00

16B. UNITED STATES OF AMERICA

BY Sandra Marshall  
(Signature of Contracting Officer)

16C. DATE SIGNED

5/25/00

**1. In Clause E.6 ACCEPTANCE AND FINAL PAYMENT FOR GOES N, O, P & Q, item number three service number three shall read as follows:**

3	SXI	Provide an interface which allows the collection and downlink of acceptable data products. Failure to provide SXI HASS Electronics Box thermistor data via the "Winchester connectors" will not constitute a failure of service for the purposes of this contract clause only.
---	-----	--

**2. Delete Clause H.17 and mark it RESERVED.**

**3. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment B, Performance Specification

Change paragraph 4.1.6.2.1 and Table 10.2.3 to reflect changed requirements for analog MDL uniform sampling rates in accordance with CCR 4189B.

Attachment C, GOES N-Q Imager Interface Control Document

Change paragraph 3.2.3.6 c. in accordance with CCR 6006C which revises cooler exposure to the sun.

Attachment D, N-Q Sounder Instrument Interface Control Document

Change paragraph 3.2.3.7 c. in accordance with CCR 6006C which revises cooler exposure to the sun.

Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

Change paragraph 2.2.2 to reflect current drawing revisions as stated in CCR 8022A

**4. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 3  
Page 37  
Page 57

Performance Specification

Paragraph 4.1.6.2.1  
Table 10.2.3

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**INDEX OF CLAUSES FOR NAS5-98069  
MODIFICATION NO. 37**

**SECTION H**

- H.1 OPTION FOR ADDITIONAL SPACECRAFT
- H.2 LAUNCH SERVICES
- H.3 PRE-DETERMINED ADJUSTMENT FOR LATE DELIVERY
- H.4 ADDITIONAL GOVERNMENT ACCOMMODATIONS
- H.5 SUBCONTRACTING PLAN AND REPORTS FOR SMALL, SMALL  
DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS CONCERNS  
(GSFC 52.219-90) (JULY 1996)
- H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR  
1989)
- H.7 CONTRACTOR ASSISTANCE
- H.8 INCENTIVE SUBCONTRACTING PROGRAM
- H.9 SECTION H CLAUSES INCORPORATED BY REFERENCE
- H.10 ELECTION OF GOVERNMENT-PROVIDED LAUNCH SERVICES AND ADVANCE  
AGREEMENT FOR DEDUCTIVE CHANGE FOR GOVERNMENT PROVIDED  
LAUNCH SERVICES
- H.11 ADVANCE UNDERSTANDING REGARDING SETTLEMENT OF TERMINATION  
OF CONTRACTOR PROVIDED LAUNCH SERVICES
- H.12 LICENSES AND PERMITS FOR A LAUNCH SERVICE OPERATOR
- H.13 INSIGHT AND GOVERNMENT APPROVAL
- H.14 GOES N REPLACEMENT FOR FIRST YEAR SERVICE FAILURES
- H.15 NO COST TECHNICAL TRADES
- H.16 ADDITIONAL ADJUSTMENTS FOR LATE DELIVERIES
- H.17 RESERVED
- H.18 REVISED DATE FOR LATE INSTRUMENTS
- H.19 ONE TIME SLIP FOR GOES O
- H.20 ADJUSTED GROUND STORAGE RATE FOR GOES N AND O
- H.21 SPECIAL PERFORMANCE REQUIREMENTS

**SECTION I**

- I.1 LIST OF SECTION I CLAUSES INCORPORATED BY REFERENCE
- I.2 APPROVAL OF CONTRACT (52.204-1) (DEC 1989)
- I.3 RIGHTS TO PROPOSAL DATA (52.227-23) (TECHNICAL) (JUN 1987)
- I.4 SUBCONTRACTS (FIXED-PRICE CONTRACTS) (52.244-1) (FEB 1995)
- I.5 CLAUSES INCORPORATED BY REFERENCE (52.252-2) (JUN 1988)
- I.6 RIGHTS IN DATA--GENERAL (52.227-14) (JUN 1987) as modified by NASA FAR  
Supplement 18-52.227-14--ALTERNATE II (JUN 1987)

**SECTION J**

- J.1 LIST OF ATTACHMENTS (GSFC 52.210-101) (OCT 1988)

**SECTION E OF NAS5-98069  
MODIFICATION NO. 37  
INSPECTION AND ACCEPTANCE**

3. Service number 1 and 2, as listed below, must be functional, as defined below. No more than 3 of the other services listed shall have failed prior to spacecraft acceptance.

<u>Service</u>	<u>Service Name</u>	<u>Description</u>
1	Imager	Provide an interface which allows the collection, downlink and retransmission of acceptable data products
2	Sounder	Provide an interface which allows the collection, downlink and retransmission of acceptable data products
3	SXI	Provide an interface which allows the collection and downlink of acceptable data products. Failure to provide SXI HAS5 Electronics Box thermistor data via the "Winchester connectors" will not constitute a failure of service for the purposes of this contract clause only.
4	Lightning Mapper (when applicable)	Provide an interface which allows the collection and downlink of acceptable data products
5	Magnetometer	Meet performance specifications
6	EPS & HEPAD	Meet performance specifications
7	XRS/EUV	Meet performance specifications. Failure to meet performance specifications as a result of degradation of the EUV filters will not constitute a failure of service for the purposes of this contract clause only.
8	WEFAX	Meet performance specifications
9	DCS	Meet performance specifications
10	EMWIN	Meet performance specifications
11	S&R	Meet performance specifications

(End of clause)

**SECTION H OF NAS5-98069  
MODIFICATION NO. 37  
SPECIAL CONTRACT REQUIREMENTS**

negotiations will be conducted by the technical representatives of the Government and the Contractor. In these cases, no Standard Form 1411 will be submitted, and the issue of cost will be limited to ensuring that the Government does not incur additional cost because of the ECP. The negotiations and resultant agreements will not include trading of "priced" offers, nor an agreement on price; rather, the trading of technical equivalency in requirements and the performance/operability of the resulting GOES System. Nothing in this clause shall be construed to limit the rights of either party under the "Changes" clause of this contract (52.243-1).

(End of clause)

**H.16 ADDITIONAL ADJUSTMENTS FOR LATE DELIVERY**

For GOES N, O, P, and Q, if the delay is attributable to the performance of the Contractor, and not the launch services provider, the Contractor shall pay the Government the sum of \$50,000 per day, up to a maximum of \$12,000,000. Delays to the engineering handover date resulting from the shutdown of a launch vehicle production line caused by a launch vehicle accident, or due to a failure investigation following a launch vehicle anomaly, shall not be considered within the control of the Contractor for the purpose of this provision. Nothing in this clause shall otherwise limit the rights of either party under Clause H.3(c) herein.

(End of clause)

**H.17 RESERVED**

**H.18 REVISED RATE FOR LATE GFE INSTRUMENTS**

If the one-time delivery slip as defined in Clause H.4.a is not implemented, the daily rate for late "Other" GFE instruments due the Contractor for GOES O, P and Q as set forth in Clause H.4.b shall not take effect unless the delay in providing these instruments is later than 30 days prior to the date originally specified for delivery of the SXI for each instrument.

(End of clause)

**\*Updated to Modification 37 \***

**ATTACHMENT B**

**S-415-22**

**PERFORMANCE SPECIFICATION**

**FOR THE**

**GEOSTATIONARY OPERATIONAL ENVIRONMENTAL  
SATELLITE**

**GOES-N,O,P,Q**

**AUGUST 26, 1997**

**NASA/GODDARD SPACE FLIGHT CENTER  
GREENBELT, MARYLAND 20771**

A ground monitoring capability to confirm that the spacecraft is generating and applying the correct compensation signal(s) and analysis capabilities to combine the various signals to isolate/identify anomalies shall be provided.

**4.1.6.2 Performance Determination** - The following capabilities shall be provided to facilitate INR anomaly resolution:

**4.1.6.2.1 Angular Displacement Sensor (ADS)/Angular Velocity Sensor (AVS)** - The capability to measure angular displacement from 2.3 Hz to 200 Hz in three axes to an accuracy of 0.2  $\mu$ radians  $1\sigma$  per axis for angular displacement amplitudes  $< 20 \mu$ radians and to an accuracy of 2.0  $\mu$ radians  $1\sigma$  per axis for angular displacement amplitude  $< 200 \mu$ radians, at the spacecraft-Imager and the spacecraft-SXI interfaces shall be provided. A second range of 1.0 to 1000  $\mu$ radians or 0 to 50 mrad/sec shall be selectable by command. This data shall be sampled with sample period 1.25 milliseconds  $\pm 0.025$  milliseconds in each of the three axes and sent to the NOAA SOCC via the MDL. The frequency response of each ADS/AVS unit shall be measured during unit level testing in the frequency range of 0.1 Hz to 200 Hz. CCR4189E Mod37 CCR 6013 Mod 24

**4.1.6.2.2 INR Pointing Errors** - The capability to quantitatively determine the contributions to the INR in-orbit performance from the spacecraft, Imager, Sounder, and SSGS shall be provided. The INR performance requirements to be determined are: navigation, within-frame registration, and frame-frame registration. As a minimum, it shall be possible to determine the respective contributions to the INR performance errors due to the following:

1. Spacecraft control system noise.
2. Spacecraft control system errors.
3. Spacecraft dynamic interactions.
4. Instrument-induced attitude disturbances (e.g., caused by blackbody calibrations or SXI motions).
5. Errors in the estimation of the various required compensations (e.g., curve fit errors for rapidly changing thermal induced pointing errors).
6. Errors resulting from differences between the desired compensation of the instrument line-of-sight and the resulting instrument applied compensation.
7. Instrument pointing errors associated with the servo performance.
8. Thermally induced non-repeatable errors (spacecraft & instruments).
9. Orbit determination errors.
10. Attitude determination errors.
11. Estimates of non-repeatable errors (magnitude & characteristics).

This determination capability may be provided through additional sensors, hardware and/or software in the spacecraft and SSGS. The  $3\sigma$  accuracy of the determination shall be demonstrated to be within  $\frac{1}{4}$  of a pixel for measurements related to landmarks, and within 4  $\mu$ radians E-W and 7  $\mu$ radians N-S for stars and all other measurements; statistical averaging may be used.

**4.1.6.3 INR Calibration** - The current calibration capabilities to determine spacecraft motion caused by instrument blackbody calibrations, perform star tracking for indefinite periods, and image the moon shall be continued and maintained. Additional calibration capabilities shall be provided, if required, to initialize, calibrate, and/or maintain the INR performance.

**4.1.7 INR Budget Summary** - For the purpose of developing the INR system level budgets, Table 4.1.7-1 contains the INR budget allocations for the Imager; and Table 4.1.7-2 contains the INR budget allocations for the



**Table 10.2.3**  
**Parameters and Rates**

Parameter	Sample Rate	
Frame sync	Once per frame	
SXI image data	100 KBPS	
IOO image data	100 KBPS	
Normal mode S/C telemetry data	4 KBPS	
Dwell mode S/C telemetry data	4 KBPS	
Fill data	As required	
<u>Analog Data</u>		
Imager servo error	1.25 msec+/-0.025 msec, each N/S and E/W	CCR4189B
Imager IMC analog data	1.25 msec+/-0.025 msec, each N/S and E/W	Mod 37
Sounder servo error	2.50 msec+/-0.025 msec, each N/S and E/W	
SXI ADS data	1.25 msec+/-0.025 msec, each axis (x,y,z)	
Optical bench ADS data	1.25 msec+/-0.025 msec, each axis (x,y,z)	

**10.2.3.2 Modulation Characteristics** - The MDL multiplexer data stream to the MDL modulator shall be continuous.

#### **10.2.4 Processed Data Relay Transponder Requirements**

**10.2.4.1 No Access Output Power** - To enable CDAS ground system time delay calibration for PDR ranging, the PDR transponder EIRP shall not exceed +10 dBm with a carrier uplink of 0.25 watts. Compliance with this requirement shall be demonstrated during ground tests with an input test cable providing a 290 K source temperature and no signal.

**10.2.4.2 Time Delay** - The PDR transponder time delay shall not exceed 1400 ns, when measured with a digital PN sequence, and shall not vary more than  $\pm 25$  ns over all spacecraft environments.

**10.2.5 Digital WEFAX Transponder Requirements** - The digital WEFAX signal defined in Tables 10.2.1.10 and 10.2.1.12 includes the use of concatenated convolutional rate  $\frac{1}{2}$ , constraint length  $K = 7$  inner and Reed-Solomon 223, 255 outer code.

**10.2.5.1 Baseband Pulse Shaping** - The digital WEFAX implementation includes the use of a Nyquist raised-cosine channel filter in cascade with an  $x/\sin x$ -shaped aperture equalizer for shaping the NRZ pulses prior to RF transmission. The CDAS transmit channel characteristic shall have a roll-off of 1.0 and an apportionment of 0.5. The out-of-band attenuation at  $(1 + 1.0)146.5$  ksp/s shall be  $\geq 30.0$  dB.

**10.2.5.2 Sideband Regrowth** - Sideband regrowth due to satellite channel non-linearities shall not produce sidebands greater than -18 dB referenced to the modulation main lobe.

**10.2.6 EMWIN Transponder Requirements** - The EMWIN link shall provide a minimum BER performance of  $10^{-2}$  at a data rate of 25 kbps with no forward error correction coding, NRZ-L formatted and BPSK modulated, in compliance with Table 10.2.1.8-1. The EMWIN transponder EIRP shall be the maximum allowed by the PFD limits of subsection 10.2.1.9.

**10.2.7 DCPR Transponder Requirements** - The DCPR transponder is frequency division multiple accessed (FDMA) with two 400 kHz bands, termed the domestic and international bands, respectively. Each band is further subdivided into 200 1.5-kHz and 33 3-kHz channels. Data collection platforms

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1

3

2. AMENDMENT/MODIFICATION NO.

Thirty-Eight (38)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-98069

10B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE  
CONTRACT ORDER NO. IN ITEM 10A

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:  
Clause 52.243-1 Changes Fixed Price—Alt. II

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Request (CCR) 4220, which revises Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J. T. Felicita  
Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

J. T. Felicita  
(Signature of person authorized to sign)

15C. DATE SIGNED

5/18/00

16B. UNITED STATES OF AMERICA

BY Sandra Marshall  
(Signature of Contracting Officer)

16C. DATE SIGNED

5/18/00

**1. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, make the following changes:**

Decrease N25, Launch Vehicle Pre-Installation Review from \$5,000,000 to \$2,000,000.  
Decrease N59, Flight Operations Training Program Completed from \$10,000,000 to \$2,000,000.

Decrease N61, Complete Fit Check, from \$8,000,000 to \$2,000,000  
Increase N18, SSGS Pre-Ship Review, from \$5,000,000 to \$9,000,000.

Add N76, Electronic Data Distribution System & Configuration Management Review, \$2,000,000, 5/10/00.

Add N77, Rebaseline Schedule Review, \$6,000,000, 5/11/00.

Add N78, Integration and Test (I&T) Review, \$5,000,000, 6/15/00.

**2. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment K, Performance Based Payments Completion Criteria

Add item N76, Electronic Data Distribution System & Configuration Management Review, with a completion criteria of 1.

Add item N77, Rebaseline Schedule Review, with a completion criteria of 1.

Add item N78, Integration and Test (I&T) Review, with a completion criteria of 1.

**3. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 12

Page 14-24

Attachment K

Page 4-5

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR listed in Block 14 of Page 1.

END OF MODIFICATION

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N12.	Critical Design Review	\$2,500,000	3/8/99
N13.	Test Readiness Review	\$3,100,000	8/17/99
N14.	Acceptance Review	\$10,000,000	10/14/99

**Spacecraft Support Ground System Reviews**

N15.	System Concept Review	\$2,500,000	5/7/98
N16.	Preliminary Design Review	\$1,000,000	7/31/98
N17.	Critical Design Review	\$3,000,000	4/9/99
N18.	Pre-Shipment Review	\$9,000,000	3/14/00
N19.	Acceptance Review	\$3,500,000	7/2/03

**Launch Services**

N20.	Launch Vehicle Interface Requirements Document	\$3,750,000	6/22/98
N21.	Spacecraft/Launch Vehicle Interface Control Document	\$1,000,000	3/1/99
N22.	Mission Integration Program Kickoff Review	\$1,000,000	8/14/98
N23.	Final Loads Verification Review	\$2,500,000	8/16/00
N24.	Launch Vehicle Requirements Review	\$5,000,000	1/19/99
N25.	Launch Vehicle Pre-Installation Review (Major Components)	\$2,000,000	2/12/02
N26.	Launch Vehicle Design Certification Review	\$3,500,000	8/7/02
N27.	Launch Vehicle Pre-Ship Review	\$2,000,000	4/5/02

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**Contractor Defined Milestones**

N41.	GOES N and O Team Kickoff	\$1,000,000	2/11/98
N42.	Contract Award to Panametrics for SEM Instruments	\$3,000,000	3/4/98
N43.	Deliver Engineering Communications Model Data	\$8,000,000	10/7/98
N44.	S/C Emulator & PES PDR	\$8,000,000	11/3/98
N45.	Gate 3 - GOES Bus Layout Complete	\$7,500,000	12/11/98
N46.	Gate 5 - GOES Antenna Design Complete	\$6,000,000	12/23/98
N47.	RESERVED		
N48.	GTACS/NTACTS Proof-of-Concept Demo	\$5,500,000	2/15/99
N49.	Gate 4 - GOES Payload Layout Complete	\$6,500,000	2/19/99
N50.	Communication Subsystem CDR	\$3,500,000	3/10/99
N51.	RESERVED		
N52.	Version Description Document - Build 4	\$3,500,000	6/18/99
N53.	RESERVED		
N54.	Deliver Flight Communications Model Data	\$3,000,000	9/8/99
N55.	Gate 7 - Start Bus Integration	\$6,000,000	11/25/99
N56.	Deliver Ground System SOCC/CDASs	\$2,600,000	3/23/00
N57.	Gate 9 - Bus Complete	\$2,000,000	3/24/00
N58.	GOES N End-to-End Test 1A Completed	\$2,500,000	6/23/00
N59.	Flight Operations Training Program Completed	\$2,000,000	10/4/00

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N60.	Spacecraft Training Program Plan (Final)	\$8,000,000	11/28/00
N61.	Complete Fit Check	\$2,000,000	12/1/00
N62.	GOES N End-to-End Test 2 Completed	\$4,000,000	1/26/01
N63.	Launch Site Test Procedures	\$4,000,000	3/19/01
N64.	INR System Description and Analysis Document (Final)	\$4,000,000	4/27/01
N65.	Contingency Simulation # 1	\$4,000,000	8/2/02
N66.	Dress Rehearsal	\$3,000,000	9/13/02-
N67.	GOES-N Data Book	\$10,000,000	10/08/00
N68.	GOES-N End-to-End Test 4 Completed	\$3,000,000	5/14/01
N69.	Algorithm Design Description - Build 3	\$4,000,000	1/20/99
N70.	1553 Data Bus Diagnostics Features Meeting	\$2,000,000	2/11/99
N71.	PES ADD Walk-Thru Review	\$2,000,000	7/15/99
N72.	PES Prototype GUI Demo	\$2,000,000	7/15/99
N73.	PES Delivery	\$500,000	10/15/99
N74.	Wideband Tape Recorder Delivery & Training	\$470,000	3/31/00
N75.	Safehold Mode Proposal	\$24,471	3/15/00
N76.	Electronic Data Distribution System & Configuration Management Review	\$2,000,000	5/10/00
N77.	Rebaseline Schedule Review	\$6,000,000	5/11/00
N78.	Integration and Test (I&T) Review	\$5,000,000	6/15/00

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**GOES O**

**Spacecraft System Level Reviews**

O1.	Critical Design Review	\$2,000,000	2/11/00
O2.	Mission Operations Review	\$10,000,000	4/2/02
O3.	Pre-Environmental Review	\$10,000,000	4/18/02
O4.	Pre-Storage Review	\$12,000,000	12/11/02
O4A.	Pre-Shipment Review	\$1,000,000	12/11/03
O5.	Flight Operations Review	\$1,000,000	1/9/04
O6.	Spacecraft Launch Readiness Review	\$1,000,000	4/4/04

**Software Subsystem Reviews**

O7.	Critical Design Review	\$4,500,000	9/27/99
O8.	Test Readiness Review	\$3,000,000	1/3/00
O9.	Acceptance Review	\$2,000,000	3/13/00

**Launch Services**

O10.	Launch Vehicle Interface Requirements Document	\$2,500,000	12/20/99
O11.	Spacecraft/Launch Vehicle Interface Control Document	\$2,100,000	1/27/00
O12.	Mission Integration Program Kickoff Review	\$2,500,000	8/11/99
O13.	Final Loads Verification Review	\$10,000,000	5/30/02
O14.	Launch Vehicle Requirements Review	\$5,000,000	12/16/99



**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

O15.	Launch Vehicle Pre-Installation Review (Major Components)	\$11,500,000	8/19/03
O16.	Launch Vehicle Design Certification Review	\$1,000,000	2/5/04
O17.	Launch Vehicle Pre-Ship Review	\$2,500,000	10/10/03
O18.	Booster on Stand (BOS) Review	\$1,000,000	2/5/04
O19.	Pre-Payload Mate Review	\$1,000,000	3/18/04
O20.	Launch Vehicle Mission Peculiar/ Mission Unique Preliminary Design Review	\$2,000,000	1/11/00
O21.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$500,000	3/15/03
O22.	RESERVED		
O23.	RESERVED		
O24.	External Independent Readiness Review	\$1,000,000	2/12/04
O25.	Senior NASA Management Mission Readiness Review	\$1,000,000	3/10/04
O26.	Launch Readiness Review	\$1,000,000	3/31/04
System Events			
O27.	Spacecraft Engineering Handover	\$2,000,000	4/30/04
O28.	Final On-orbit Acceptance	\$1,000,000	9/24/04
Contractor Defined Milestones			
O29.	Gate 7 - Start Bus Integration	\$1,900,000	2/11/00

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

O30.	Gate 9 - Bus Complete	\$1,000,000	8/24/00
O31.	Gate 10 - Payload Complete	\$4,000,000	1/16/01
O32.	Bus & SEM Instruments Integration & Test Complete	\$13,000,000	1/16/01
O33.	XRS/EUV/EPS/HEPAD Flight Unit #2 (N-O Spares) Pre-Shipment Review	\$10,500,000	12/07/01
O34.	Gate 12 - GOES O S/C to System Test	\$10,000,000	4/03/02
O35.	Gate 13 - GOES O S/C Complete	\$12,000,000	1/07/03
O36.	GOES-O End-to-End Test 4 Completed	\$2,000,000	12/05/02

**GOES P**

**Spacecraft System Level Reviews**

P1.	Critical Design Review	\$3,750,000	2/6/04
P2.	Mission Operations Review	\$4,000,000	4/5/05
P3.	Pre-Environmental Review	\$4,000,000	7/5/05
P4.	Pre-Shipment Review	\$2,400,000	11/29/05
P5.	Flight Operations Review	\$2,400,000	1/12/06
P6.	Spacecraft Launch Readiness Review	\$2,300,000	4/4/06

**Software Subsystem Reviews**

P7.	Critical Design Review	\$7,000,000	11/4/03
P8.	Test Readiness Review	\$3,750,000	12/30/03
P9.	Acceptance Review	\$3,750,000	3/2/04

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**Launch Services**

P10.	Launch Vehicle Interface Requirements Document	\$3,750,000	11/28/03
P11.	Spacecraft/Launch Vehicle Interface Control Document	\$4,000,000	1/5/05
P12.	Mission Integration Program Kickoff Review	\$7,000,000	10/8/03
P13.	Final Loads Verification Review	\$4,000,000	7/29/05
P14.	Launch Vehicle Requirements Review	\$7,500,000	11/3/04
P15.	Launch Vehicle Pre-Installation Review (Major Components)	\$4,000,000	8/25/05
P16.	Launch Vehicle Design Certification Review	\$5,000,000	10/5/05
P17.	Launch Vehicle Pre-Ship Review	\$5,000,000	10/19/05
P18.	Booster on Stand (BOS) Review	\$2,400,000	1/4/06
P19.	Pre-Payload Mate Review	\$2,400,000	3/17/06
P20.	Launch Vehicle Mission Peculiar/ Mission Unique Preliminary Design Review	\$3,750,000	4/7/04
P21.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$7,500,000	10/6/04
P22.	Launch Vehicle Component/ System Design Review (Major Mods only) (PDR Level)	\$3,750,000	6/30/04

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

P23.	Launch Vehicle Component/ System Design Review (Major Mods only) (CDR Level)	\$4,000,000	12/8/04
P24.	External Independent Readiness Review	\$2,400,000	2/10/06
P25.	Senior NASA Management Mission Readiness Review	\$2,400,000	3/8/06
P26.	Launch Readiness Review	\$2,300,000	3/29/06

**System Events**

P27.	Spacecraft Engineering Handover	\$5,000,000	4/30/06
P28.	Final On-orbit Acceptance	\$8,900,000	9/28/06

**Contractor Defined Milestones**

P29.	Kickoff Meeting	\$6,000,000	5/12/03
P30.	Deliver Launch Services Proposal	\$6,000,000	6/13/03
P31.	Manufacturing Readiness Review	\$6,000,000	7/17/03
P32.	Preliminary Design Review (If req'd)	\$6,000,000	8/14/03
P33.	Transfer SEM instruments from precontractual stores	\$6,000,000	9/15/03
P34.	Communication Subsystem to Integration	\$3,750,000	5/14/04
P35.	T&C Subsystem to Integration	\$3,750,000	6/14/04
P36.	Gate 11 - Antenna to Integration	\$3,750,000	6/25/04
P37.	ACS Subsystem to Integration	\$3,750,000	8/16/04

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

P38.	Gate 9 - Bus Complete	\$3,750,000	9/1/04
P39.	Bus & SEM Instruments Integration & Test Complete	\$3,750,000	9/17/04
P40.	S/C Unit Integration Complete	\$4,000,000	2/15/05
P41.	SEM Instruments Integration & Test	\$4,000,000	3/14/05
P42.	Gate 12 - S/C to System Test	\$4,000,000	4/4/05
P43.	GFE Integration	\$4,000,000	5/16/05
P44.	Complete EMI/EMC Test	\$4,000,000	6/15/05

**GOES Q**

**Spacecraft System Level Reviews**

Q1.	Critical Design Review	\$3,600,000	2/7/06
Q2.	Mission Operations Review	\$3,900,000	4/3/07
Q3.	Pre-Environmental Review	\$3,900,000	7/3/07
Q4.	Pre-Shipment Review	\$2,300,000	11/27/07
Q5.	Flight Operations Review	\$2,300,000	1/15/08
Q6.	Spacecraft Launch Readiness Review	\$2,200,000	4/4/08

**Software Subsystem Reviews**

Q7.	Critical Design Review	\$7,000,000	11/3/05
Q8.	Test Readiness Review	\$3,600,000	12/29/05
Q9.	Acceptance Review	\$3,600,000	3/2/06

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**Launch Services**

Q10.	Launch Vehicle Interface Requirements Document	\$3,600,000	11/29/05
Q11.	Spacecraft/Launch Vehicle Interface Control Document	\$3,900,000	1/8/07
Q12.	Mission Integration Program Kickoff Review	\$7,000,000	10/10/05
Q13.	Final Loads Verification Review	\$3,900,000	7/27/07
Q14.	Launch Vehicle Requirements Review	\$7,000,000	11/6/06
Q15.	Launch Vehicle Pre-Installation Review (Major Components)	\$3,900,000	8/27/07
Q16.	Launch Vehicle Design Certification Review	\$4,900,000	10/8/07
Q17.	Launch Vehicle Pre-Ship Review	\$4,900,000	10/22/07
Q18.	Booster on Stand (BOS) Review	\$2,300,000	1/7/08
Q19.	Pre-Payload Mate Review	\$2,300,000	3/19/08
Q20.	Launch Vehicle Mission Peculiar/ Mission Unique Preliminary Design Review	\$3,600,000	4/10/06
Q21.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$7,000,000	10/9/06
Q22.	Launch Vehicle Component/ System Design Review (Major Mods only) (PDR Level)	\$3,600,000	7/3/06

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

Q23.	Launch Vehicle Component/ System Design Review (Major Mods only) (CDR Level)	\$4,000,000	12/11/06
Q24.	External Independent Readiness Review	\$2,300,000	2/13/08
Q25.	Senior NASA Management Mission Readiness Review	\$2,300,000	3/10/08
Q26.	Launch Readiness Review	\$2,300,000	3/31/08

**System Events**

Q27.	Spacecraft Engineering Handover	\$4,900,000	4/30/08
Q28.	Final On-orbit Acceptance	\$9,000,000	9/26/08

**Contractor Defined Milestones**

Q29.	Kickoff Meeting	\$5,800,000	5/11/05
Q30.	Deliver Launch Services Proposal	\$5,800,000	6/14/05
Q31.	Manufacturing Readiness Review	\$5,800,000	7/18/05
Q32.	Preliminary Design Review (If req'd)	\$5,800,000	8/15/05
Q33.	Transfer SEM instruments from precontractual stores	\$5,800,000	9/14/05
Q34.	Communication Subsystem to Integration	\$3,600,000	5/15/06
Q35.	T&C Subsystem to Integration	\$3,600,000	6/14/06
Q36.	Gate 11 - Antenna to Integration	\$3,600,000	6/27/06
Q37.	ACS Subsystem to Integration	\$3,600,000	8/16/06

**SECTION B OF NAS5-98069  
MODIFICATION NO. 38  
SUPPLIES OR SERVICES AND PRICES/COSTS**

Q38.	Gate 9 - Bus Complete	\$3,500,000	9/1/06
Q39.	Bus & SEM Instruments Integration & Test Complete	\$3,500,000	9/19/06
Q40.	S/C Unit Integration Complete	\$3,900,000	2/13/07
Q41.	SEM Instruments Integration & Test	\$3,900,000	3/12/07
Q42.	Gate 12 - S/C to System Test	\$3,900,000	4/2/07
Q43.	GFE Integration	\$3,900,000	5/14/07
Q44.	Complete EMI/EMC Test	\$3,900,000	6/13/07

If a review for GOES O, P or Q is not required, in accordance with paragraph 1.1 of the Statement of Work, the contractor shall submit the invoice for that associated event at the specified time in this clause.

(End of Clause)



**GOES N**

N68.	GOES N End-to-End Test 4 Completed	6
N69.	Algorithm Design Description – Build 3	6
N70.	1553 Data Bus Diagnostics Features Meeting	6
N71.	PES ADD Walk-Thru Review	1
N72.	PES Prototype GUI Demo	6
N73.	PES Delivery	4
N74.	Wideband Tape Recorder Delivery & Training	6
N75.	Safehold Mode Proposal	6
N76.	<b>Electronic Data Distribution System &amp; Configuration Management Review</b>	1
N77.	<b>Rebaseline Schedule Review</b>	1
N78.	<b>Integration and Test (I&amp;T) Review</b>	1

**GOES O**

Milestone	Description	Completion Criteria
O29.	Gate 7 - Start Bus Integration	5
O30.	Gate 9 - Bus Complete	5
O31.	Gate 10 - Payload Complete	5
O32.	Bus & SEM Instruments Integration & Test Complete	6
O33.	XRS/EUV/EPS/HEPAD Flight Unit#2 (N-O Spares) Pre-Shipment Review	1
O34.	Gate 12 - GOES O S/C to System Test	5
O35.	Gate 13 - GOES O S/C Complete	5
O36.	GOES O End-to-End Test 4 Completed	6

**GOES P**

Milestone	Description	Completion Criteria
P29.	Kickoff Meeting	1
P30.	Deliver Launch Services Proposal	3
P31.	Manufacturing Readiness Review	1
P32.	Preliminary Design Review (If req'd)	1
P33.	Transfer SEM instruments from precontractual stores	6
P34.	Communication Subsystem to Integration	6
P35.	T&C Subsystem to Integration	6
P36.	Gate 11 - Antenna to Integration	5
P37.	ACS Subsystem to Integration	6

**GOES P**

P38.	Gate 9 - Bus Complete	5
P39.	Bus & SEM Instruments Integration & Test Complete	6
P40.	S/C Unit Integration Complete	6
P41.	SEM Instruments Integration & Test	6
P42.	Gate 12 - S/C to System Test	5
P43.	GFE Integration	6
P44.	Complete EMI/EMC Test	6

**GOES Q**

Milestone	Description	Completion Criteria
Q29.	Kickoff Meeting	1
Q30.	Deliver Launch Services Proposal	3
Q31.	Manufacturing Readiness Review	1
Q32.	Preliminary Design Review (If req'd)	1
Q33.	Transfer SEM instruments from precontractual stores	6
Q34.	Communication Subsystem to Integration	6
Q35.	T&C Subsystem to Integration	6
Q36.	Gate 11 - Antenna to Integration	5
Q37.	ACS Subsystem to Integration	6
Q38.	Gate 9 - Bus Complete	5
Q39.	Bus & SEM Instruments Integration & Test Complete	6
Q40.	S/C Unit Integration Complete	6
Q41.	SEM Instruments Integration & Test	6
Q42.	Gate 12 - S/C to System Test	5
Q43.	GFE Integration	6
Q44.	Complete EMI/EMC Test	6

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT1. CONTRACT ID CODE  
N/APAGE OF  
1 22. AMENDMENT/MODIFICATION NO.  
Thirty-Nine (39)3. EFFECTIVE DATE  
See Block 16C4. REQUISITION/PURCHASE REQ. NO.  
See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6) CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(x)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 See Page 2

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE  
CONTRACT ORDER NO. IN ITEM 10A.B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office,  
Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X

d. OTHER (Specify type of modification and authority)  
Unilateral Modification; Clause H.6 LIMITATION OF FUNDSE. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$17,000,000 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)

BY Sandra Marshall  
(Signature of Contracting Officer)

N 7540-01-152-8070

30-105

STANDARD FORM 30 (Rev. 10-83)

Prescribed by GSA

PREVIOUS EDITION UNUSABLE

1. In Clause H.6, increase the funding by \$17,000,000 to \$201,128,313. The period of allotment is from the effective date of the contract through August 31, 2000 in accordance with the contractor's correspondence dated May 15, 2000.

2. Block 12 Accounting and Appropriation Data:

PCN: 415-52589A(1C)  
JON: 415-616-41-81-11  
APP: 800/10110(00)  
BLI: A703  
OC: 41-2550  
AMT: \$17,000,000

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 39  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on a semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$201,128,313 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:

**SECTION H OF NAS5-98069  
MODIFICATION NO. 39  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until August 31, 2000.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

# AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT

APPROVAL #: 2700-0042

1. CC  
N/A

JE

PAGE OF

1

5

2. AMENDMENT/MODIFICATION NO.  
Forty (40)

3. EFFECTIVE DATE  
See Block 16C

4. REQUISITION  
Se. 12

5. PROJECT NO. (If applicable)

ISSUED BY  
ASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)  
NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE	FACILITY CODE
(x) 9A. AMENDMENT OF SOLICITATION NO.	9B. DATED (SEE ITEM 11)
X 10A. MODIFICATION OF CONTRACT/ORDER NO. NASS-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Clause 52.243-1 Changes Fixed Price—Alt. II
	d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4133D, 4195, 4216, 4217, 6032B, 6033, 6034C, 6045A, 6046A, 6048, 6051B, 6066, 6069A, 6071A, 6072, 6089A, 6090 and 6094 at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

J.T. Felicita  
(Signature of person authorized to sign)

7/12/2000

BY  
(Signature of Contracting Officer)

7540-01-152-8070

30-105

STANDARD FORM 30 (Rev. 10-83)

PREVIOUS EDITION UNUSABLE

Prescribed by GSA

**1. Add the following to the end of Clause H.3(c):**

Delay in delivery or performance due solely to the lack of availability of the Deep Space Network shall be considered to be beyond the control and without the fault or negligence of the contractor for the purposes of this clause.

**2. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment A, Statement of Work

An administrative correction is made to section 3.3.13 to reflect the change made in modification number 13, CCR 4074A.

Add the following to the end of 3.6:

The Government will provide the Deep Space Network (DSN) for the launch and orbit raising phase of GOES N, O, and P missions. The Government does not assume any liability for the DSN. The contractor shall provide all necessary spacecraft technical information and support requirements for input to a Project Service Level Agreement (PSLA) and a Detailed Mission Requirements (DMR) document. The final PSLA and DMR will be prepared by the Government.

Attachment B, Performance Specification

Change the date of the Rehosted OATS Requirements Overview listed in Applicable Documents as originally reflected in CCR 6040A. This is an administrative change only.

In section 7.2.1 revise item #5 and add items #22 and #23 as reflected in CCR 4133D and item #20k. as reflected in CCR 4195 to address additional capability in the MRS&S and GTACS components of the SSGS.

In section 7.2.4 add item #5 to reflect additional capabilities in the MRS&S and GTACS components of the SSGS.

Add the following to the end of section 8.4.7.2.1:

Units inside the Faraday Cage may include the 40 dB of shielding effectiveness of the Faraday Cage in the test data review to the requirement of Figure 8.4.7.2.1.



Add the following to the end of section 8.4.7.2.2:

Units inside the Faraday Cage may include the 40 dB of shielding effectiveness of the Faraday Cage in the test data review to the requirement of Figure 8.4.7.2.2. -

Add the following to section 8.5.3.1:

One flight article from each component type listed in table 8.5.3.1a shall undergo 8 cycles of thermal vacuum testing at protoflight levels. The flight article can be selected from any of the GOES N, O or spare component builds provided the unit thermal vacuum test is performed at least one month in advance of the GOES-N system level thermal vacuum.

Also add table 8.5.3.1a.

Add 8.6.5.1.1 and 8.6.5.1.2 as reflected in CCR 6032B to clarify pyro shock test requirements.

Revise 10.5.6, as reflected in CCR 6051B, to modify the grounding requirement.

#### Appendix A, Deviation and Waiver Requests

In 8.5.2.1, note the reduction in the SEM unit qualification temperature margin as reflected in CCR 6066.

In 8.6.3.2, note the clarification to the random vibration requirements as reflected in CCR 6069A and the change to the battery vibration test as reflected in CCR 6048.

In 8.6.5.2, note the waiver to the spacecraft level mechanical shock test as reflected in CCR 6033.

In section 10.5.2, table 32a, note the deviation statement as reflected in CCR 6049. This is an administrative change only.

In section 10.11.3, note the adhesive outgassing deviation as reflected in CCR 6045A, the paint/wash primer deviation as reflected in CCR 6046A, and the nylon usage deviation as reflected in CCR 6072.

Appendix B, Component EMI/EMC Test GSFC/HSC Memorandum of Understanding

Update table 32A to add component EMI testing and allow protoflight EMI testing on flight components other than GOES N as reflected in CCR 6071A

Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

Mechanical interface drawings shall be revised as reflected in CCR 6034C.

Attachment H, List of Government Furnished Property

Change the delivery date of the SXI Engineering Model from May 2000 to October 2, 2000.

Change the delivery date of the S/N 08 Imager and S/N 08 Sounder from April 2000 to December 01, 2000.

**5. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 44

Attachment A, Statement of Work

Section 3.3.13

Section 3.6

Attachment B, Performance Specification

List of Applicable Documents

Section 7.2.1

Section 7.2.4

Section 8.4.7.2.1

Section 8.4.7.2.2

Section 8.5.2.1

Section 8.5.3.1

Table 8.5.3.1a

Performance Specification

Section 8.6.3.2  
Section 8.6.5.1.1  
Section 8.6.5.1.2  
Section 8.6.5.2  
Section 10.5.2  
Section 10.5.6  
Section 10.11.3

Appendix A

2 pages

Attachment H, List of Government Furnished Property

3 pages

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 40  
SPECIAL CONTRACT REQUIREMENTS**

**H.3 PRE-DETERMINED ADJUSTMENT FOR LATE DELIVERY**

(a) If the engineering handover date, as defined in the contract schedule, of any spacecraft is delayed by more than thirty (30) days by the contractor, the contractor shall pay to the Government, for each calendar day of delay, beginning with the thirty-first day from the originally specified engineering handover date until the actual engineering handover date of said spacecraft, the sum of \$50,000, up to a maximum of \$ \_\_\*, for each spacecraft. The form of payment, whether a contract credit or otherwise, will be determined by the Contracting Officer. The prices in this paragraph may be impacted by Clause H.16.

\* GOES-N = \$5,000,000 and GOES-O, P & Q = \$2,000,000 each

(b) Alternatively, if delivery or performance is so delayed, the Government may terminate this contract in whole or in part under the Default-Supply and Service clause in this contract and in that event, the Contractor shall be liable for \$50,000 per day, which shall not exceed the maximum of \$12,000,000, accruing until the time the Government may reasonably obtain delivery or performance of similar supplies or services. This clause shall not diminish any rights to which the Government is entitled under the Default clause or any other clause of this contract.

(c) The Contractor shall not be charged with late delivery fees or liquidated damages when the delay in delivery or performance arises out of causes beyond the control and without the fault or negligence of the Contractor as defined in the Default--(Fixed Price Supply and Service) (FAR 52.249-8) clause in this contract. Delay in delivery or performance due solely to the lack of availability of the Deep Space Network shall be considered to be beyond the control and without the fault or negligence of the contractor for the purposes of this clause.

(End of Clause)

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 5

2. AMENDMENT/MODIFICATION NO.

Forty-One (41)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.

NAS5-98069

10B. DATED (SEE ITEM 13)

01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

Clause 52.243-1 Changes Fixed Price—Alt. II

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4161A, 4220, 6012, 6028A, 6053A, 6060A, 6065A, 6068, 6078, 6082A, 6083A, 6087, 6092, 6102, 6105, 6106A, 7021A, 7022C, 7023A, 7024B, 7027A, and 8019B at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

J.T. Felicita  
(Signature of person authorized to sign)

15C. DATE SIGNED

11/8/00

16B. UNITED STATES OF AMERICA

BY

Sandra Marshall  
(Signature of Contracting Officer)

16C. DATE SIGNED

11/14/00

N 7540-01-152-8070

30-105

STANDARD FORM 30 (Rev. 10-83)

PREVIOUS EDITION UNUSABLE

Prescribed by GSA

**1. In Clause F.1 DELIVERY SCHEDULE, change the date of item number 7 SXI to Spacecraft Harness from September 1999 to March 2000.**

**2. In Clause F.2 ENGINEERING HANDOVER DATES AND STORAGE DATES, change the first sentence in the second paragraph to read as follows:**

"The contractor shall place the GOES N and O spacecraft into storage at the contractor's facility immediately following successful completion of spacecraft Integration and Test (I&T), but no earlier than the dates specified for Earliest Storage Date (ESD)."

**3. In Clause H.4 ADDITIONAL GOVERNMENT ACCOMMODATIONS, change the first sentence of paragraph f. to read as follows:**

"At least six (6) months prior to the engineering handover date, if the spacecraft requires storage, the Government may direct the contractor to store the spacecraft and perform a post-storage test program as required by the contract specification or directed by the Government. If storage is directed, it shall be at the contractor's facility."

**4. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment B, Performance Specification

Add the following:

4.1.1.9 Imager/Sounder Initialization – INR shall operate but need not meet INR requirements during and for 2 minutes after Imager or Sounder initialization.

In 4.1.6.2.1, change the ADS angular velocity range requirements as reflected in CCR 6065A.

Modify 8.4.11 to reflect the common mode noise measurements as reflected in CCR 6053A.

In 8.6.4.2 and 8.6.4.3, modify the sine vibration test requirement as reflected in CCR 6012.

Add the following:

10.9.15 Imager and Sounder Compensation – The flight software shall telemeter the computed Imager and sounder compensation signals in the normal telemetry stream at 1Hz(+/-10%).

#### Appendix A, Deviation and Waiver Requests

In 3.7, note the deviation from the spacecraft controlled relay redundancy as reflected in CCR 6078.

In 10.1.2.1 and 10.1.3.1, note the deviation from the command verification requirement as reflected in CCR 6092.

#### Attachment C, GOES N-Q Imager Interface Control Document

Remove proprietary markings and make clarifications/corrections to schematics in Figures 3.5.3-3, 3.5.4-1, 3.5.4-2, 3.5.4-4a, 3.5.4-5, 3.5.4-8, 3.5.4-9 and 3.5.4-10 as reflected in CCR 6083A.

Modify table 3.5.1-5 to clarify data strobe rise/fall time requirement.

Modify figures 3.4.1-2, 3.5.1-3, 3.5.1-4, 3.5.2-2, 3.5.2-3, 3.5.2-4x, 3.5.2-5, 3.5.4-2, 3.5.4-5 and 3.5.4-10 to reflect the correct schematics as stated in CCR 6060A.

Correct bit position labeling in 3.5.4.3.4, 3.5.3, tables 3.5.4-9, 5.1.1-1, 5.1.2-1 and figures 3.5.4-3 and 3.5.4-7 as reflected in CCR 7027A.

In 3.4.1.2, clarify the harness connector keying/shielding as reflected in CCR 6028A.

Make corrections to Figures 3.4.1-4, 3.4.2-2, 3.5.2-4a, 3.5.2-4b, 3.5.2-4c, 3.5.2-4d, 3.5.2-4e, 3.5.2-4f, 3.5.2-4g, 3.5.3-3, 3.5.4-4a, 3.4.1-2, 3.5.1-2, 3.5.1-3, 3.5.1-3b, 3.5.1-3c, 3.5.1-4, 3.5.2-1, 3.5.2-2, 3.5.2-3, 3.5.2-5, and 3.5.4-1 as reflected in CCR 7023A.

Make corrections to 1., 2.3, 3.2.3.2, 3.2.4.2, 3.4.2.3.1, 3.4.2.3.3, 3.6.1.4, table 3.4.3-1, 3.5.1-5, 3.5.1-6, 3.5.2-7, 3.5.4-1 and figure 3.5.3-4 as reflected in CCR 7021A.

Attachment D, N-Q Sounder Instrument Interface Control Document

Remove proprietary markings and make clarifications/corrections to schematics in Figures 3.5.3-3, 3.5.4-1, 3.5.4-2, 3.5.4-4a, 3.5.4-5, 3.5.4-8, 3.5.4-9 and 3.5.4-10 as reflected in CCR 6083A.

Modify table 3.5.1-5 to clarify data strobe rise/fall time requirement.

Modify figures 3.4.1-2, 3.5.1-3, 3.5.1-4, 3.5.2-2, 3.5.2-3, 3.5.2-4x and 3.5.2-5 to reflect the correct schematics as stated in CCR 6060A.

Correct bit position labeling in 3.5.4.3.4, 3.5.3, tables 3.5.4-9, 5.1.1-1, 5.1.2-1 and figures 3.5.4-3 and 3.5.4-7 as reflected in CCR 7027A.

In 3.4.1.2, clarify the harness connector keying/shielding as reflected in CCR 6028A.

Make corrections to figures 3.5.2-4a, 3.5.2-4b, 3.5.2-4c, 3.5.2-4d, 3.5.2-4e, 3.5.2-4f, 3.5.2-4g, 3.5.2-4h, 3.5.3-3, 3.5.4-4a, 3.4.1-2, 3.4.1-4, 3.5.1-2, 3.5.1-3, 3.5.1-3b, 3.5.1-3c, 3.5.1-4, 3.5.2-1, 3.5.2-2, 3.5.2-3, 3.5.2-5, 3.5.4-1 and 3.5.4-2 as reflected in CCR 7024B.

Make corrections to 1., 3.2.1.3, 3.2.3.2, 3.2.3.5, 3.2.4.2, 3.4.2.3.1, 3.4.2.3.3, 3.6.1.4, table 3.4.3-1, 3.5.1-5, 3.5.1-6, 3.5.3-3, 3.5.4-13, 5.1.3-1 and figure 3.5.4-11 as reflected in CCR 7022C.

Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

An administrative correction is made to table 3-26 to reflect the changed made in CCR 6061A under contract modification number 36.

Change 3.4.5.2 to include fault monitoring as reflected in CCR 8019B.

Replace previous document with Revision A as stated in CCR 6102.

Change 3.4.3.2 and incorporate new tables 3-15 a. through f. to reflect total incident thermal flux as stated in CCR 6082A



**5. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 38  
Page 40  
Page 46  
Page 76

Attachment B, Performance Specification

Section 3.7  
Section 4.1.1.9  
Section 4.1.6.2.1  
Section 8.4.11  
Section 8.6.4.2  
Section 8.6.4.3  
Section 10.1.2.1  
Section 10.1.3.1  
Section 10.9.15

Appendix A

1 page

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**SECTION F OF NAS5-98069  
MODIFICATION NO. 41  
DELIVERIES OR PERFORMANCE**

**F.1 DELIVERY SCHEDULE (GSFC 52.212-93) (OCT 1988)**

The items required by this contract shall be delivered as follows:

<u>Contract Line Item Number (CLIN)</u>	<u>Description</u>	<u>Delivery Date</u>	<u>SOW Reference</u>
1.	On-Orbit Acceptance of GOES N Spacecraft	End of GOES N PLT	3.6.4
2.	Propulsion Computer Model & Supporting Documentation	GOES N ESD-3 mos.	3.2.3.1
3.	Software Development & Validation Environment GTACS Workstation for SXI T&C, I&V, and Software Development	GOES N ESD-3 mos. February 1999	3.2.12.5
4.	Source & Executable Flight Software Code	GOES N ESD-3 mos.	
5.	Emulators S/C Emulators (2)	GOES N ESD -16 mos.	3.1.13 & 3.3.13 Spec 11.3
6.	INR Performance Evaluation System	Spacecraft CDR + 3 mos.	3.2.16.1 3.3.16 Spec. 11.4
7.	SXI to Spacecraft Harness	March 2000	3.3.11.4
8.	Battery Test Cells (5 from each activation lot)	1 mo. after S/C Contractor Acceptance of Flight Cells	3.3.6.1

**SECTION F OF NAS5-98069  
MODIFICATION NO. 41  
DELIVERIES OR PERFORMANCE**

- |     |   |                |
|-----|---|----------------|
| 21. | Additional Integration &<br>Testing Support | See Clause H.4 |
| 22. | Spacecraft Storage                          | See Clause H.4 |

Solely for purposes of mailing DD Form 250, the shipment address shall be to the Contracting Officer, Mail Code 214.2, NASA/GSFC, Greenbelt, MD 20771.

(End of clause)

**F.2 ENGINEERING HANDOVER DATES AND STORAGE DATES**

The following dates are defined as the engineering handover dates and the earliest dates at which the spacecraft may be placed into ground storage as defined in Clause H.4:

	<u>Earliest Ground Storage Date</u>	<u>Engineering Handover Date</u>
GOES N	October 1, 2001	October 31, 2002
GOES O	January 1, 2003	April 30, 2004
GOES P	January 1, 2006	April 30, 2006
GOES Q	January 1, 2008	April 30, 2008

The contractor shall place the GOES N and O spacecraft into storage at the contractor's facility immediately following successful completion of spacecraft Integration and Test (I&T), but no earlier than the dates specified for Earliest Storage Date (ESD). No storage charges, as defined in Clause H.4, shall be paid prior to the ESD.

(End of clause)

**F.3 SECTION F CLAUSES INCORPORATED BY REFERENCE**

- (52.242-15) STOP-WORK ORDER (AUG 1989)  
(52.247-34) F.O.B. DESTINATION (NOV 1991)

(End of By Reference Section)

**SECTION H OF NAS5-98069**  
**MODIFICATION NO. 41**  
**SPECIAL CONTRACT REQUIREMENTS**

Government and the contractor shall agree on the need for and value of an equitable adjustment to the contract price for performing the required integration and test tasks.

d. The Government may elect to launch a mission without the SXI or Lightning Mapper instruments at no change to the contract price with four (4) months notice prior to the engineering handover date.

e. The Government may direct additional days of testing for each spacecraft, or its replacement spacecraft. A day is defined as 16 hours for ambient testing and 24 hours for thermal vacuum testing. Once the Government directs this testing, if the thirty (30) day grace period specified in paragraph b. has been consumed, the contractor will have five (5) days to assess any impact to the engineering handover date and inform the Government of the impact, if any. If it is determined that there is no impact to the earliest storage date and/or engineering handover date, the Government shall pay to the contractor the following daily rates for this additional testing:

	<u>GOES N</u>	<u>GOES O</u>	<u>GOES P</u>	<u>GOES Q</u>
Ambient Testing	\$ 31,000	\$ 32,000	\$ 35,000	\$ 38,000
Thermal Vacuum Testing	\$ 45,000	\$ 46,000	\$ 51,000	\$ 56,000

This clause does not apply to testing that is required to demonstrate that the contractor will meet specifications.

f. At least six (6) months prior to the engineering handover date, if the spacecraft requires storage, the Government may direct the contractor to store the spacecraft and perform a post-storage test program, as required by the contract specification or directed by the Government. If storage is directed, it shall be at the contractor's facility. Storage shall be in compliance with the contract specification and shall include routine monitoring, testing (if required) and maintenance of proper environments.

The Government shall pay to the contractor (unless Clause H.20 is effective) the following rates for each spacecraft or subsequent replacement:

GROUND STORAGE (monthly):

<u>GOES N</u>	<u>GOES O</u>	<u>GOES P</u>	<u>GOES Q</u>
\$270,000	\$283,000	\$48,000	\$206,000

**SECTION J OF NAS5-98069  
MODIFICATION NO. 41  
LIST OF ATTACHMENTS**

**J.1 LIST OF ATTACHMENTS (GSFC 52.210-101) (OCT 1988)**

The following attachments constitute part of this contract:

<u>Attachment</u>	<u>Description</u>	<u>Date</u>
A	Statement of Work	August 26, 1997
B	Performance Specification	August 26, 1997
C	GOES-N-Q Imager Interface Control Document	Revision D
D	N-Q Sounder Instrument Interface Control Document	Revision D
E	Interface Control Document for the Solar X-Ray Imager (SXI)	Revision A
F	RESERVED	
G	Contract Document Requirements List	August 26, 1997
H	List of Government Furnished Property	August 26, 1997
I	Program Review Requirements	August 26, 1997
J	Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan	January 12, 1998
K	Performance Based Payments Completion Criteria	August 26, 1997
	Performance Based Payments Completion Criteria (Contractor Provided Milestones)	Revision A September 10, 1998
L	Interface Control Document for the Solar X-Ray Imager Ground Support Equipment and Hughes GOES Satellite (N,O,P,Q) Integration and Test	September 9, 1999

(End of clause)

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT1. CONTRACT ID CODE  
N/APAGE OF  
1 2

2. AMENDMENT/MODIFICATION NO. Forty-Two (42)	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. See Block 12	5. PROJECT NO. (If applicable)
ISSUED BY NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		7. ADMINISTERED BY (If other than Item 6) NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE (X)	9A. AMENDMENT OF SOLICITATION NO.	FACILITY CODE 9B. DATED (SEE ITEM 11)
X	10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

## ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 See Page 2

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	d. OTHER (Specify type of modification and authority) Unilateral Modification; Clause H.6 LIMITATION OF FUNDS

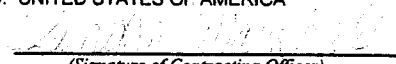
E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$10,655,656 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J.T. Felicita, Manager, NASA Contracts	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall
15B. CONTRACTOR/OFFEROR  (Signature of person authorized to sign)	15C. DATE SIGNED
16B. UNITED STATES OF AMERICA BY  (Signature of Contracting Officer)	16C. DATE SIGNED

N 7540-01-152-8070

30-105

PREVIOUS EDITION UNUSABLE

STANDARD FORM 30 (Rev. 10-83)  
Prescribed by GSA

1. In Clause H.6, increase the funding by \$10,655,656 to \$211,783,969. The period of allotment is from the effective date of the contract through October 31, 2000 in accordance with the contractor's correspondence dated June 30, 2000.

2. Block 12 Accounting and Appropriation Data:

PCN: 415-54766A(1C)

JON: 415-616-41-81-11

APP: 800/10110(00)

BLI: A704

OC: 41-2550

AMT: \$10,655,656

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 42  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$211,783,969 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:



**SECTION H OF NASS-98069  
MODIFICATION NO. 42  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until October 31, 2000.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 5

2. AMENDMENT/MODIFICATION NO.  
Party-Three (43)3. EFFECTIVE DATE  
See Block 16C4. REQUISITION/PURCHASE REQ. NO.  
See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY CODE  
NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 200717. ADMINISTERED BY (If other than Item 6) CODE  
NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X 10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14. PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:  
Clause 52.243-1 Changes Fixed Price—Alt. II

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4215, 4225, 6026A, 6070A, 6086, 6091B, 6093, 6098, 6100A, 6104, 6114, 6115A, 7026C, 7030 and 8035 at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

J.T. Felicita  
(Signature of person authorized to sign)

11/29/00

BY Sandra Marshall  
(Signature of Contracting Officer)

11/30/00

SN 7540-01-152-8070

30-105

PREVIOUS EDITION UNUSABLE

STANDARD FORM 30 (Rev. 10-83)

Prescribed by GSA

**1. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, change the following events.**

Decrease N05, S/C System Pre-Environmental Review from \$11,000,000 to \$7,000,000.  
Decrease O33, XRS/EUV/EPS/HEPAD FLT #2 (N-O Spares) Pre-Shipment Review from \$10,500,000 to \$6,500,000.

Increase N13, Software Test Readiness Review from \$3,100,000 to \$7,100,000.

Increase O08, Software Test Readiness Review from \$3,000,000 to \$7,000,000.

**2. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment A, Statement of Work

In 3.6.2.6, add "The spacecraft contractor shall supply 14 additional mission operations tools (spacecraft models 1/48)."

Modify 3.2.12.2 and 3.2.12.3 to remove the Firmware Support Manual and Software Version Description Document.

Modify 1.4 to reflect the revised office space allocation stated in CCR 6115A.

Attachment B, Performance Specification

In 7.2.1, change item 15 to add the GOES Archive – GAIM Interface Control Document as an applicable document.

Revise 10.5.5.2 to specify maximum battery depth-of-discharge for all spacecraft operating modes and battery calibration during eclipse season as reflected in CCR 6026A.

Revise 10.1.2.1.4.3 to reflect the Imager/Sounder black body calibration requirement in CCR 6070A.

Revise 10.5.4.1 to reflect the thermal cycle and thermal vacuum cycle requirement for the solar array yoke in CCR 6091B.

Appendix B, Component EMI/EMC Tests

In table 32a, note the deletion of the Conducted Susceptibility and Conducted Emission testing for the Solar Array Drive and X-Ray Positioner power lines as reflected in CCR 6093.

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Attachment C, GOES N-Q Imager Interface Control Document

Update the current document to the Revision E release as reflected in CCR 6100A.

Update the ICD drawings to Revision B as reflected in CCR 7026C.

Modify 3.4.2.3.3 to revise the calculation for electrical power during scan turnaround as reflected in CCR 7030.

Attachment D, N-Q Sounder Instrument Interface Control Document

Update the current document to the Revision E release as reflected in CCR 6100A.

Update the ICD drawings to Revision B as reflected in CCR 7026C.

Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

Update 2.2.2 to reflect drawing in CCR 6086.

Add 3.1.2-7

"The Data Electronics power cable (U12) between the SXI power electronics and SXI Data Electronics Box, as shown in LMATC 2A06603, shall be less than 81 inches."

Add 3.4.5.5.3, 3.4.5.5.3-1, 3.4.5.5.3-2, 3.4.5.5.3-3 and Figure 3-13 to notify SXI on Imager/Sounder black body calibration as reflected in CCR 6070A.

Attachment G, Contract Document Requirements List

Modify Table 1 to delete SDA 3.2.12-06 Version Description Document and SDA-3.2.12-08 Firmware Support Manual.

Change the current CDRL submittal dates to the following:

I&T 3.4.6-01 Launch Site Integration Plan – final at L-3 mos.; interim at L-12 mos.

I&T 3.4.6-02 Launch Commit Criteria – final at L-3 mos.; interim at PER.

I&T 3.4.9-01 Transportation & Handling Plan & Procedures – final at L-3 mos.; interim at L-12 mos.

I&T 3.4.6-04 Ground Operations Plan – final at L-3 mos.

I&T 3.4.6-05 Missile Systems Pre-Launch Safety Package – final at L-3 mos.

SDA 3.2.13-02 S/C Emulator's User's Operations & Maintenance Manual – at Emulator delivery + 1 month.

**5. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 11

Page 12

Page 16

Page 18

Attachment A, Statement of Work

Section 1.4

Section 3.2.12.2

Section 3.2.12.3

Section 3.6.2.6

Attachment B, Performance Specification

Section 7.2.1

Section 10.1.2.1.4.3

Section 10.5.4.1

Section 10.5.5.2

Appendix B

Page 2

Attachment G, Contract Document Requirements List

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Table 1

SDA 3.2.12-06

SDA 3.2.12-08

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**SECTION B OF NAS5-98069  
MODIFICATION NO. 43  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS**

In accordance with Clause B.4 PERFORMANCE BASED PAYMENTS (52.232-32), and upon successful completion of an event, as defined in B.6 DETERMINATION OF EVENT COMPLETION, the contractor may request performance based payments based for the following Events: (Requests for payment for milestones completed in September after the September request for payment has been submitted and milestones completed in October, will be submitted in November)

<u>Event No.</u>	<u>Event</u>	<u>Amount</u>	<u>Date</u>
<u>GOES N</u>			
Spacecraft System Level Reviews			
N1.	System Concept Review	\$3,750,000	5/5/98
N2.	Preliminary Design Review	\$1,500,000	8/13/98
N2A.	Preliminary Design Review Updates	\$1,000,000	12/20/98
N3.	Critical Design Review	\$6,500,000	5/13/99
N4.	Mission Operations Review	\$2,400,000	5/12/00
N5.	Pre-Environmental Review	\$7,000,000	9/19/00
N6.	Pre-Storage Review	\$4,000,000	5/21/01
N6A.	Pre-Shipment Review	\$5,500,000	5/21/02
N7.	Flight Operations Review	\$4,000,000	6/6/02
N8.	Spacecraft Launch Readiness Review	\$2,000,000	10/5/02
Software Subsystem Reviews			
N9.	Concept Review	\$3,000,000	3/5/98
N10.	Requirements Review	\$2,500,000	5/7/98
N11.	Preliminary Design Review	\$1,000,000	7/9/98

**SECTION B OF NAS5-98069  
MODIFICATION NO. 43  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N12.	Critical Design Review	\$2,500,000	3/8/99
N13.	Test Readiness Review	\$7,100,000	8/17/99
N14.	Acceptance Review	\$10,000,000	10/14/99

**Spacecraft Support Ground System Reviews**

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N15.	System Concept Review	\$2,500,000	5/7/98
N16.	Preliminary Design Review	\$1,000,000	7/31/98
N17.	Critical Design Review	\$3,000,000	4/9/99
N18.	Pre-Shipment Review	\$9,000,000	3/14/00
N19.	Acceptance Review	\$3,500,000	7/2/03

**Launch Services**

N20.	Launch Vehicle Interface Requirements Document	\$3,750,000	6/22/98
N21.	Spacecraft/Launch Vehicle Interface Control Document	\$1,000,000	3/1/99
N22.	Mission Integration Program Kickoff Review	\$1,000,000	8/14/98
N23.	Final Loads Verification Review	\$2,500,000	8/16/00
N24.	Launch Vehicle Requirements Review	\$5,000,000	1/19/99
N25.	Launch Vehicle Pre-Installation Review (Major Components)	\$2,000,000	2/12/02
N26.	Launch Vehicle Design Certification Review	\$3,500,000	8/7/02
N27.	Launch Vehicle Pre-Ship Review	\$2,000,000	4/5/02



**SECTION B OF NAS5-98069  
MODIFICATION NO. 43  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**GOES O**

**Spacecraft System Level Reviews**

O1.	Critical Design Review	\$2,000,000	2/11/00
O2.	Mission Operations Review	\$10,000,000	4/2/02
O3.	Pre-Environmental Review	\$10,000,000	4/18/02
O4.	Pre-Storage Review	\$12,000,000	12/11/02
O4A.	Pre-Shipment Review	\$1,000,000	12/11/03
O5.	Flight Operations Review	\$1,000,000	1/9/04
O6.	Spacecraft Launch Readiness Review	\$1,000,000	4/4/04

**Software Subsystem Reviews**

O7.	Critical Design Review	\$4,500,000	9/27/99
O8.	Test Readiness Review	\$7,000,000	1/3/00
O9.	Acceptance Review	\$2,000,000	3/13/00

**Launch Services**

O10.	Launch Vehicle Interface Requirements Document	\$2,500,000	12/20/99
O11.	Spacecraft/Launch Vehicle Interface Control Document	\$2,100,000	1/27/00
O12.	Mission Integration Program Kickoff Review	\$2,500,000	8/11/99
O13.	Final Loads Verification Review	\$10,000,000	5/30/02
O14.	Launch Vehicle Requirements Review	\$5,000,000	12/16/99

**SECTION B OF NAS5-98069  
MODIFICATION NO. 43  
SUPPLIES OR SERVICES AND PRICES/COSTS**

O30.	Gate 9 - Bus Complete	\$1,000,000	8/24/00
O31.	Gate 10 - Payload Complete	\$4,000,000	1/16/01
O32.	Bus & SEM Instruments Integration & Test Complete	\$13,000,000	1/16/01
O33.	XRS/EUV/EPS/HEPAD Flight Unit #2 (N-O Spares) Pre-Shipment Review	\$6,500,000	12/07/01
O34.	Gate 12 - GOES O S/C to System Test	\$10,000,000	4/03/02
O35.	Gate 13 - GOES O S/C Complete	\$12,000,000	1/07/03
O36.	GOES-O End-to-End Test 4 Completed	\$2,000,000	12/05/02

**GOES P**

**Spacecraft System Level Reviews**

P1.	Critical Design Review	\$3,750,000	2/6/04
P2.	Mission Operations Review	\$4,000,000	4/5/05
P3.	Pre-Environmental Review	\$4,000,000	7/5/05
P4.	Pre-Shipment Review	\$2,400,000	11/29/05
P5.	Flight Operations Review	\$2,400,000	1/12/06
P6.	Spacecraft Launch Readiness Review	\$2,300,000	4/4/06

**Software Subsystem Reviews**

P7.	Critical Design Review	\$7,000,000	11/4/03
P8.	Test Readiness Review	\$3,750,000	12/30/03
P9.	Acceptance Review	\$3,750,000	3/2/04

## S-415-23 GOES N-Q Statement of Work

The spacecraft contractor shall provide a Critical Design Review (CDR) as defined in section 1.1. and an Acceptance Test plan and procedure for the EDDS. In addition, the spacecraft contractor shall provide the necessary documentation that can be used to instruct data users on the proper use of the system.

### 1.3.1.1 EDDS Implementation Plan

Implementation of the EDDS plan shall be as follows:

1. During the initial six months of the contract, while the EDDS is being configured, distribution of documents shall be accomplished in a manner mutually acceptable to GSFC and the spacecraft contractor.
2. Following the development and checkout of the EDDS, the spacecraft contractor shall be responsible for the electronic delivery of all CDRL items that are designated for that form of delivery in the CDRL. All CDRL items delivered during the initial six-month period described in item 1 above shall be incorporated in the EDDS at the beginning of this implementation phase.

### 1.3.2 Internal Correspondence

The spacecraft contractor shall provide all GOES-relevant technical internal correspondence. The correspondence can be informal to preserve timeliness. NASA shall have access to this correspondence on a timely basis via hard copy or the EDDS defined in section 1.3.1.

### 1.3.3 GOES Data Books

The spacecraft contractor shall provide up-to-date GOES Data Books prior to each spacecraft launch in accordance with CDRL PM-1.1-03.

## 1.4 NASA Resident Office Support

The spacecraft contractor shall provide office space, furniture, copier(s), facsimile machine(s), and phones at the spacecraft contractor's facility through launch of the last spacecraft for six NASA residents and six visiting representatives. The spacecraft contractor shall provide office space, furniture, copier(s), facsimile machine(s), and phones for an additional ten (10) visiting NASA and/or GFE instrument contractor representatives during instrument and instrument GSE integration and test activities. In addition, the spacecraft contractor shall provide the offices 3000A, 3000B, 3000C, 3000D, 3000E, 3000F, 3001, 3001A, 3001B, 3002, 3002A, 3002B, 3004, 3006, 3008, 3010, 3010A, 3010B, and 3720 in S50, as well as two offices for four personnel in Building S1, along with necessary furniture, copier(s), facsimile machine(s), and phones through commencement of storage of the GOES O spacecraft.

CCR6115A  
Mod 43

## 1.5 Special Studies

The spacecraft contractor shall perform task assignments relating to the development, implementation, characterization, and operation of the GOES mission requirements, as authorized by NASA and in accordance with contract clause C.2. Each task will be initiated by written direction from the NASA contracting officer. NASA will coordinate with the spacecraft contractor to define each task in detail, and establish manpower ceilings and performance schedules.

### **3.2.12 Flight and Electrical GSE Software Design and Analysis**

The contractor shall provide all personnel, facilities, services, and materials necessary to develop, verify, assure the quality of, and maintain all aspects of the flight and electrical GSE software development for the GOES N-Q spacecraft. All flight software shall be developed in accordance with sections 10.9 and 10.10 of the GOES N-Q Performance Specification, S-415-22. The spacecraft contractor shall treat the software component of firmware, which consists of computer programs and data loaded into a class of memory which cannot be dynamically modified by the computer during processing (e.g., programmable read-only memories, programmable logic arrays, digital signal processors, etc.), as software for the purposes of this SOW.

#### **3.2.12.1 Software Management and Development**

The spacecraft contractor shall provide the management functions necessary for the development of all flight and electrical ground support equipment software for the GOES N-Q spacecraft.

#### **3.2.12.2 Software Requirements Specification Generation**

The spacecraft contractor shall perform all analyses and systems engineering required to allocate (from system and subsystem requirements) and identify software requirements, and to develop the design specifications for GOES flight and electrical GSE software CSCIs. For each CSCI, software requirements shall be specified in a software requirements specification (SRS) (CDRL SDA-3.2.12-01) provided for government review. Software requirements traceability to system and subsystem requirements shall be provided in a traceability matrix as part of the SRS. The spacecraft contractor shall provide a software configuration management (SCM) system to control the configuration of the software code and maintain consistency between software code, software documentation, and subsystem documentation. In particular, an SCM process shall be used to control and maintain consistency of the attitude control subsystem and electrical power and distribution subsystem algorithm documents (CDRLs SDA-3.2.12-9 and -10), the software requirements specification (CDRL SDA 3.2.12-01), the software design document (CDRL SDA-3.2.12-02), and the software user and maintenance manual (CDRL SDA-3.2.12-07), as well as the code itself. ~~The Version Description Document (VDD) shall be prepared in accordance with CDRL SDA-3.2.12-06.~~ The Software Management, Development and Assurance Plan shall be prepared and submitted in accordance with CDRL SDA-3.2.12-12.

CCR 6098  
Mod 43

#### **3.2.12.3 Firmware Requirements and Design**

The software component of firmware, which consists of computer programs and data loaded into a class of memory which cannot be dynamically modified by the computer during processing shall be specified, designed, developed, and tested in the same rigorous manner as the flight software. ~~Firmware requirements, design, testing, version control, and installation procedures shall be described in the firmware support manual (CDRL SDA-3.2.12-08).~~

CCR 6098  
Mod 43

#### **3.2.12.4 Flight Software Maintenance**

The spacecraft contractor shall be responsible for maintenance of the flight software for each spacecraft. Flight software maintenance shall include identification and isolation of flight software problems;

### **3.6.2.4 Mission Operations Simulations**

The spacecraft contractor shall provide any personnel, services, and materials required to support a maximum of five training simulations for rehearsal of critical launch and on-orbit mission phases. This includes one dress rehearsal of the launch to separation sequence for each spacecraft, one nominal LOR simulation, one nominal operations simulation, and two simulations of contingencies during LOR, PLT, and normal operations phases. These simulations shall be supported by government participation. The DSN will be made available by the government for simulation purposes, if needed and requested.

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#### **3.6.2.4.1 Launch Network Countdown Simulations**

The spacecraft at the launch base shall provide real-time telemetry to the government operations center on a non-interfering basis while it is in the payload processing facility and in a launch configuration,. The spacecraft shall provide real-time telemetry to the government operations center while it is on the launch pad and in a launch configuration in support of a final countdown launch simulation,

#### **3.6.2.4.2 Pre-launch Spacecraft Data Flows**

The spacecraft shall provide real-time telemetry to the government operations center on an as available basis during the final two weeks before launch. This includes telemetry flows to the government operations center while the final launch configuration is being set.

### **3.6.2.5 Procedure Development**

The spacecraft contractor shall provide all personnel, services and materials required to develop all orbit raising procedures, including bus checkout procedures. The spacecraft contractor shall provide these procedures to NASA for final approval. NASA retains responsibility for, and execution of, GFE instrument procedures and activities. NASA also retains responsibility for development of all on-orbit operations procedures based on spacecraft contractor supplied outlines. NASA will provide all procedures to the spacecraft contractor for review.

#### **3.6.2.5.1 Contingency Procedures**

The spacecraft contractor shall provide all personnel, services, and materials required to create a complete set of contingency operations procedures (COPs) covering all spacecraft bus operations prior to the engineering handover, as described in following section 3.6.3.3. The spacecraft contractor shall also provide any personnel, services and materials required by NASA for the creation of on-orbit COPs. The spacecraft contractor shall provide new COP outlines required by any new hardware or software changes for GOES-O,P,Q. COPs for GFE instruments shall be developed by NASA and incorporated into the spacecraft contractor-supplied COPs.

#### **3.6.2.6 Training Program**

The spacecraft contractor shall provide all personnel, services, and materials necessary to deliver and present a training program to the GOES N-Q government team, in accordance with CDRL OPS-3.6.1-02. The training shall be performed at a government furnished facility located near GSFC. The training program shall consist of not less than 120 hours of classroom training. The training shall consist of detailed subsystem analysis,

## S-415-23 GOES N-Q Statement of Work

including design and development overviews, detailed engineering drawing reviews, operations concepts, hardware/software interfaces, and a description of the resolution of all problems encountered in the subsystem development. The training shall also include interfaces with the ground system, and changes and/or upgrades that affect INR. All training presentations shall be videotaped for archival purposes.

GOES-N training shall be provided no later than 12 months before launch. For GOES O-Q, the training shall be abbreviated to include only baseline changes and unique features or problems encountered with the specific spacecraft. For GOES O-Q the training shall be provided no later than 6 months prior to launch.

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The spacecraft contractor shall provide six mission operations training tools (spacecraft models 1/24 scale). The spacecraft contractor shall supply 14 additional mission operations training tools (spacecraft models 1/48 scale).

CCR4142A.  
Mod 29  
CCR 4225  
Mod 43

### 3.6.3 Launch and Orbit Raising (LOR) Support

The spacecraft contractor shall provide personnel, services, and materials required to perform launch preparations, launch support, orbit raising maneuvers, spacecraft appendage deployments, spacecraft bus and SEM instrument checkout, and support for NASA to perform GFE instrument operations. NASA has requirements for certain activities during the orbit raising phase as described in S-415-22, section 6.2.2. The spacecraft contractor shall provide a mission profile in accordance with CDRL OPS-3.6.1-01.

Orbit raising activities shall be conducted by the spacecraft contractor from a government operations center facility. NASA retains responsibility for all GFE instrument activities through engineering handover.

#### 3.6.3.1 Engineering Support

The spacecraft contractor shall provide continuous engineering support during the LOR mission phase, i.e., from launch through engineering handover. This includes performing all monitoring and analysis functions, executing all orbital maneuvers, and deploying all spacecraft appendages. GFE instrument deployments shall be performed by NASA.

#### 3.6.3.2 Spacecraft Checkout

The spacecraft contractor shall provide all personnel, services, and materials required to complete the orbit raising within 18 days and perform spacecraft bus checkout within 6 days thereafter.

#### 3.6.3.3 Engineering Handover

The spacecraft contractor shall provide all personnel, services, and materials required to perform an engineering handover to NASA after spacecraft bus checkout, at Launch + 24 days, at which time NASA assumes responsibility for the health and safety of the spacecraft. The spacecraft contractor shall perform an engineering review to denote the completion of handover in accordance with CDRL OPS-3.6.3-01. The spacecraft contractor shall present an LOR data review within 5 weeks of this handover (L+2 months) in accordance with CDRL OPS-3.6.3-02.

In a non-nominal launch situation, the spacecraft contractor shall provide engineering and operations support until the engineering handover is accomplished.

7. Process telemetry and distribute to operator workstations within 0.5 seconds of its receipt at the control center, distributing telemetry updates at the same rate as telemetry blocks/minor frames are received from the spacecraft.
8. Process and output clear mode and encrypted commands at the maximum allowable rate of the as-built N-Q spacecraft command receivers, outputting commands issued by a commanding workstation within one telemetry block/minor frame update period.
9. Support the scheduling, commanding, and telemetry processing requirements of the yaw flip maneuver.
10. Fail over to redundant systems within one minute; in the case of failure of an operator position commanding a spacecraft, switchover of any non-command mode operator position to command mode within 15 seconds of operator initiation of the action.
11. Support up to 100 user workstations, each capable of performing real-time commanding and telemetry monitoring, spacecraft operations scheduling, and off-line telemetry analysis functions.
12. Provide sufficient capacity to support telemetry and command processing for eight real and simulated GOES N-Q spacecraft concurrently.
13. Provide processing system resource margins of 50% (e.g., CPU speed, RAM and disk capacities) for every component (excluding the GIMTACS operator workstations) when supporting three fully operational spacecraft configurations and using the full capabilities of all components (the spacecraft contractor can assume the GIMTACS/PACS replacement workstations will have this capacity). GTACS components shall have this resource margin at final delivery before the GOES-N launch.
14. Provide redundancy such that no single point of failure, workstation outage, or system performance degradation in the GTACS will disrupt or preclude real-time telemetry and command processing operations.
15. Use the GOES I-M Archive System for the on-line storage of the GOES N-Q DSN and CDA (2209 MHz and 1694 MHz) PCM telemetry streams, NTAacts AGC data, Imager and Sounder wideband telemetry received from the SPS, and SXI data received from the MRS&S. The interface between GTACS and the GOES I-M archive system shall be implemented in accordance with the ISI GOES Archive - GAIM Interface Control Document, ISI-NQ-GTACS-0006.
16. Provide an SSGS configuration monitoring function to monitor the status and send configuration commands to all GOES N-Q SSGS component systems, similar to the GIMTACS configuration page.
17. Provide an operator workstation function meeting the following general requirements (and design goals, given that reuse of the replacement GIMTACS workstations is required):
  - a. Windows-based graphical user interface (GUI).
  - b. Startup time from completion of cold boot in three minutes or less.
  - c. Minimum of 20 active windows to include plots, telemetry display pages, etc., while maintaining a CPU resource margin goal of 50% at final delivery before the GOES-N launch.
  - d. Resizable windows minimizable to an icon, with selectable font sizes to permit zooming and full page width views of open windows.
  - e. Concurrent off-line analysis or scheduling function operation without disruption to real-time telemetry monitoring functions.
  - f. Hard copy page snap capability for any active window.
  - g. On-line, context sensitive help and an on-line copy of the user's manual.
  - h. User input/response logging.
  - i. Text messaging capability to address any connected GTACS, SPS, PM, or GOES N-Q OATS workstation. For those systems, such as the PM, without this capability, the spacecraft contractor shall define the message structure.
  - j. Text file output to local/system printer.
  - k. Workstation hard disk space warning alert program.
  - l. Visual and audible alarm upon loss of a telemetry stream being monitored.
18. Provide the following specific real-time operator/engineer (Ops/Eng) workstation capabilities:
  - a. Real-time spacecraft commanding restricted to one workstation per spacecraft at any one time.

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10.1.2.1.3 **Command Sequences** - The capability to execute a function requiring a series of commands shall be provided. It shall be possible to call these command sequences from within other sequences to perform generic functions. At least two command sequences may be active concurrently. A command sequence identifier shall be available for telemetry upon the start of execution of the sequence, as shall the identifier for each individual command executed as part of the command sequence. Command sequences shall be executed either in real time or as stored commands.

10.1.2.1.4 **Instrument Command Functions** - Command functions shall be provided to support the following operations: Imager/Sounder frames, Imager/Sounder star sense, and Imager/Sounder black body calibration.

10.1.2.1.4.1 **Imager/Sounder Frame** - This function may be invoked by a time-tagged command executed from a storage buffer. The function will send a sequence of time-spaced commands to either the Imager or Sounder, as specified in the command data, to execute a frame. One Imager frame and one Sounder frame may be active concurrently. The command function will access frame geometry from a separate data table stored in on-board RAM. Storage will be provided for 100 different frame definitions.

10.1.2.1.4.2 **Imager/Sounder Star Sense** - This function may be invoked by a time-tagged command executed from a storage buffer. This function will send commands to either the Imager or Sounder, as specified in the command data, to execute a star sense. The command function will access star sense attitude data from a separate data table stored in on-board RAM. Storage will be provided for two separate tables of 2048 different Imager/Sounder stars. Only one of these tables will be active at any given time.

10.1.2.1.4.3 **Imager/Sounder Black Body Calibration** - This function may be invoked by a time-tagged command invoked from a storage buffer. This function will send commands to either the Imager or Sounder, as specified in the command data, to execute a black body calibration. ~~The function will strobe the SXI to provide notification of the beginning (deleted) of the black body calibration.~~

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10.1.2.2 **Command Data Rate, Format, and Error Detection** - The command data transmission bit rate and format shall be as specified in Table 10.0. Additionally, the command data timing extraction mechanism shall not lose lock during the reception of the maximum possible number of continuous ones or zeros used in the command data format.

The command data format shall be as specified in Table 10.0. Detection of an incorrect decoder address by any decoder shall inhibit loading of that command, and shall not affect the existing contents of the decoder. The execution of corrupted commands shall be prevented. Loss of command carrier shall abort the execution of any real-time command and clear the command buffer. The command system shall provide an indication of command rejection.

10.1.2.3 **Clear/Secure Command Operations** - The spacecraft contractor shall provide an NSA-approved secure command operating mode. A command decrypter shall be associated with each command baseband chain, individually commandable, and shall have its status telemetered.

The clear text/secure text modes shall be selectable by ground command. Upon application of spacecraft bus power, the decryption key and vehicle command count (VCC) shall contain initial values of zero. New decryption keys and VCC values shall be ground commandable for each individual command decrypter. The spacecraft contractor shall propose a time-out after which both baseband chains will



## 10.5 Power and Electrical

**10.5.1 Energy** - The power subsystem's solar array and batteries shall provide sufficient energy to support any operating mode within the requirements of this specification throughout the spacecraft lifetime.

**10.5.2 Load Control** - The spacecraft shall be capable of connecting and disconnecting each load individually by command. Essential or critical loads may be hard-wired to the spacecraft bus. It shall be impossible to disconnect or otherwise disable the command function. ~~(Deleted sentence)~~ Some short-term current sharing with the battery for selected peak power conditions is allowed if approved by NASA.

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**Note: Refer to CCR6049 in Appendix A for Deviation Request**

Admin Chg.  
Deviation Note added  
in Mod 40

**10.5.3 Arm and Safe Functions** - Arm and safe functions meeting the safety and reliability requirements established by range safety shall be included.

**10.5.4 Solar Array** - The solar array shall be capable of meeting all operational power requirements without power sharing with the batteries during any normal sunlight operational mode throughout the specified spacecraft lifetime. Some short-term current sharing with the battery for selected peak power conditions is allowed if approved by NASA.

**10.5.4.1 Test Requirements** - The GOES N, O, P, and Q flight panels shall be tested to the protoflight test levels specified in Table 10.5.4.1. However, if any of the GOES N, O, P, or Q solar panels are identical in size, design, and construction to a solar panel previously qualified to GOES N, O, P, and Q thermal, environmental, mechanical, and electrical requirements, the GOES N, O, P, or Q flight panels shall be tested to the acceptance test levels specified in Table 10.5.4.1. For GOES N, O, P, and Q, life cycle test coupons consisting of a minimum of 3 strings of cells shall be constructed using the flight panel fabrication procedures. The life cycle test coupons shall include all the design and construction characteristics of their respective flight panel and may only vary in size. A minimum of 800 thermal cycles at qualification temperatures shall be performed on the life cycle test coupons for GOES N, O, P, and Q. The life cycle test coupon can be eliminated if a previous life cycle test coupon exists which is identical in all the design and construction characteristics of the respective GOES N, O, P, or Q solar panel and the number of cycles and temperature ranges envelope those of GOES N, O, P, and Q. A thermal cycle test and a thermal-vacuum cycle test shall be conducted on all the populated GOES N, O, P, and Q flight panels. The thermal cycle test shall consist of a minimum of eight thermal cycles and the thermal-vacuum cycle test shall consist of a minimum of four thermal-vacuum cycles as defined in 8.5.3.2 of this spec. The thermal cycling test shall be conducted at the component level and the thermal-vacuum cycling test shall be conducted at the spacecraft level ~~as defined in 8.5.3.2 to the appropriate temperatures defined in Table 10.5.4.1.~~ However, if during the spacecraft thermal-vacuum testing, the flight panels will not achieve temperatures within  $\pm 5^{\circ}\text{C}$  of the appropriate temperatures defined in Table 10.5.4.1, a component thermal-vacuum test to the appropriate levels defined in Table 10.5.4.1 shall be performed. This component thermal-vacuum cycling test shall consist of a minimum of 8 thermal-vacuum cycles as defined in 8.5.3.2. The component thermal-vacuum cycling test performed on the flight panels may serve as a replacement for the required component thermal cycling and spacecraft level thermal-vacuum cycling tests on the flight panels. In the event of a conflict between sections 8.5.3.2 and 10.5.4.1, section 10.5.4.1 shall govern. ~~During each solar array thermal-vacuum cycle test, the outgassing rates of~~ All the flight panels shall be measured with temperature-controlled quartz crystal microbalances (TQCM) in thermal vacuum to verify that the solar array outgassing requirement is met in accordance with paragraph 10.11.3. If the solar array outgassing requirement is not met, a corrective bake-out phase will be assessed and implemented. For GOES N, obtain at least 12 GOES N solar cells and verify that the average Solar Absorptance is consistent with the established MAT range.

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## 10.5.5 Batteries

**10.5.5.1 General Requirements** - The battery(s) shall be fully capable of performing its function throughout spacecraft launch modes, transfer orbit modes, on-orbit storage, and operational lifetime. Flight batteries shall not be used during routine ground test and integration and shall not be installed prior to 90 days before the scheduled launch.

**10.5.5.2 Depth-of-Discharge** - The battery(s) shall have sufficient capacity to operate the spacecraft on-orbit through all eclipses up to 72 minutes of total duration, with the depth of discharge (DOD) not to exceed 75% of minimum battery capacity. For launch ascent, lunar eclipse, on-orbit storage, or any single event at reduced power demand, the depth of discharge shall not exceed 75%. Similarly, the battery(s) shall have sufficient capacity to operate the spacecraft through launch, transfer orbit with no cell failures, initial outgas, stationkeeping, housekeeping, storage and end-of-life boost modes without exceeding a DOD of 75% of minimum battery capacity. Upon completion of a lunar eclipse with reduced spacecraft loads (instruments only), the battery DOD shall not exceed 75% of minimum battery capacity. With a failure to acquire the sun after a 72 minute total duration eclipse and initiation and execution of safehold maneuvers to reacquire the sun, with one cell failed, the battery DOD shall not exceed 94% of minimum battery capacity. The minimum (nameplate) battery capacity shall be greater than or equal to 123 ampere-hours during the on-orbit life of the spacecraft.

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~~A capacity check, pressure versus state-of-charge, calibration, reconditioning, or an effective alternative spacecraft contractor proposed/NASA approved, shall be performed on the battery(s) prior to each eclipse season without removing all battery capacity from the spacecraft power bus during the first five days of an eclipse season to account for the increase of hydrogen pressure over the life of the spacecraft battery(s).~~

**10.5.5.3 Reliability** - The battery(s) shall be capable of meeting all performance requirements after sustaining any single credible cell failure.

**10.5.5.4 Charging** - The battery charge control system shall be capable of recharging the battery(s) to a full state-of-charge at least once during each 24-hour period without over stressing the battery(s).

**10.5.5.5 Test Requirements** - One battery shall be qualification tested and all others shall be acceptance tested to demonstrate they are sufficiently reliable for the spacecraft mission. If an identical battery to the GOES N-Q battery has been previously qualified to GOES N-Q thermal, environmental, mechanical, and electrical requirements, battery qualification does not have to be performed for GOES N-Q. The qualification battery may be used for an integration and test battery. However, the qualification battery shall not be used for flight.

**10.5.5.6 Telemetry** - Battery cell voltage telemetry from each of the battery cells of the GOES N-Q flight batteries shall be provided to the GOES N-Q spacecraft and routed to GTACS. This telemetry is for display purposes only and need not be incorporated in any procedures or special ground processing.

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**10.5.6 Grounding** - Grounding shall be accomplished to minimize radiated and conducted noise, including common mode noise, and shall simultaneously provide electrostatic discharge (ESD) protection. Primary power (defined as the input to a DC to DC converter) shall be isolated from secondary power (defined as the output of a DC to DC converter). Primary power returns shall be connected to chassis at one point (single point ground concept) with a minimum impedance connection. Except for low level currents that are sufficiently small to meet the magnetic field requirements specified in section 9.1.1.7 in this specification, primary current shall not flow on secondary returns, secondary power shall not flow on primary returns, and DC currents shall not flow through the chassis.

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Secondary power returns shall be referenced to chassis with an impedance sufficient to meet the requirements of section 8.4, including the common mode noise requirements of section 8.4.11. The chassis shall be used as a zero signal reference plane for RF, fast rise time signals, and sensitive sensor front ends (multipoint ground concept). All interfaces between boxes shall be designed for compliance with the common mode noise requirements of 8.4.11.

Where converters are cascaded (the output of one converter is connected to the input of another), a new single point primary power ground reference (node) may be selected to establish a minimum impedance reference.

**10.5.7 Short Circuit Prevention** - The GOES N-Q spacecraft shall prevent a short circuit in any component from damaging any other component.

**10.5.8 Non-fused Power Lines** - The GOES N-Q spacecraft non-fused power lines shall be double-insulated.

**10.5.9 Power Regulators/Power Supplies** - All power regulators/power supplies shall be stable. They shall not oscillate when operated with any operational loads and subjected to any operational environmental conditions contained in this specification. The power regulators/power supplies shall also be stable and not oscillate when operated at any load conditions between 20% above maximum operational load power and 20% below minimum operational load power. The power regulators/power supplies shall have a phase margin of better than 45° and a gain margin of better than 12 dB.

## 10.6 Thermal Control

**10.6.1 General Requirement** - The spacecraft and instruments shall meet the requirements of this specification during all encountered thermal environments (system level test, launch through transfer orbit, synchronous orbit, and on-orbit storage mode).

**10.6.2 Design Requirement** - The thermal design shall maintain the spacecraft and instrument subsystems and components within their MAT limits during system level thermal balance and thermal performance testing, and also during all phases of the mission including on-orbit storage. All transistor collector junction temperatures shall be below 110°C.

**10.6.3 Uncertainties** - Predicted temperatures showing compliance with 10.6.1 and 10.6.2 shall account for all uncertainties in calculations, thermal parameters and measurements.

## 10.7 Structural

**10.7.1 General Requirements** - The structural subsystem consists of all spacecraft structural elements, including fixed appendages. A series of tests and analyses shall be conducted to demonstrate the flight hardware is qualified for the expected mission environments, including structural loads, vibroacoustics, sine vibration, mechanical shock, and pressure profiles. The hardware design must also comply with specified verification requirements, such as factors of safety, interface compatibility, structural reliability, workmanship, and associated system safety elements. The spacecraft shall accommodate hard point interfaces for operations such as lifting, rotating, and transporting.

**10.7.2 Strength Qualification by Test** - Verification of adequate strength shall be demonstrated by applying a set of loads equal to 1.25 times the limit loads, after which the hardware must be capable of meeting its performance criteria (see section 10.7.2.1 for special beryllium structure requirements). No detrimental permanent deformation shall be allowed to occur as a result of applying the loads, and all alignment requirements shall be met following the test. The strength test must be accompanied by a stress analysis to demonstrate positive margins at ultimate loads equal to 1.4 times the limit load for all

ultimate failure modes such as fracture or buckling. In addition, the analysis must show that the maximum allowable loads at the launch vehicle interface points are not exceeded and no excessive deformations occur.

If satisfactory qualification tests have been conducted on a representative model, the strength qualification testing of the protoflight unit may not be necessary, pending NASA review and approval.

**10.7.2.1 Strength Qualification for Beryllium** - All Beryllium primary and secondary structural elements shall undergo a strength test to 1.4 times the limit load. In addition: conflict between sections 8.5.3.2 and 10.5.4.1, section 10.5.4.1 shall govern. During each solar array thermal-vacuum cycle test, the outgassing rates of all the flight panels shall be measured with temperature-controlled quartz crystal microbalances (TQCM) to verify that the solar array outgassing requirement is met. If the solar array outgassing requirement is not met, a corrective bake-out phase will be assessed and implemented. For GOES N, obtain at least 12 GOES N solar cells and verify that the average Solar Absorptance is consistent with the established MAT range.

1. When using cross-rolled sheet, the design shall preclude out-of-plane loads and displacements during assembly, testing, or service life.
2. To account for uncertainties in material properties and local stress levels, a design safety factor of 1.6 on ultimate material strength shall be used.
3. Stress analysis shall properly account for the lack of ductility of the material by rigorous treatment of applied loads, boundary conditions, assembly stresses, stress concentrations, thermal cycling, and possible material anisotropy. The stress analysis shall take into account worst-case tolerance conditions.
4. All machined and/or mechanically disturbed surfaces shall be chemically milled to ensure removal of surface damage and residual stresses.
5. All parts shall undergo penetrant inspection for surface cracks and crack-like flaws per ASTM E1417, Standard Practice for Liquid Penetrant Examination.

**10.7.3 Strength Qualification by Analysis** - If appropriate development tests are performed to verify the accuracy of the stress model, stringent quality control procedures are invoked to ensure conformance of the structure (materials, fasteners, welds, processes, etc.) to the design, and the structure has well defined load paths, strength qualification may (pending review and approval) be accomplished by a stress analysis demonstrating the hardware has positive margins on yield at loads equal to 1.6 times the limit load, and positive margins on ultimate at loads equal to 2.0 times the limit load. In addition, the analysis shall show that the maximum allowable loads at the launch vehicle interface points are not exceeded and that no excessive deformations occur.

**10.7.4 Transportation and Handling Loads** - When transportation and handling loads are not enveloped by the maximum expected flight loads, the transportation and handling loads shall be included in the set of design limit loads.

**10.7.5 Clearance Verification** - Analysis shall be conducted to verify dynamic clearances between the spacecraft and launch vehicle and between members within the spacecraft for all significant ground test and flight conditions. Adequate clearances shall be verified assuming worst-case static clearances and quasi-static and dynamic deflections due to 1.4 times the applicable flight limit loads or flight-level ground test levels. Deviations from the 1.4 times factor shall be justified by analysis and with NASA approval.

Table 32a GOES N-Q EMI/EMC Component Test Plan

Component/Test Media	CE	CS	RE	RS
<b>Attitude Control Subsystem</b>				
Attitude Control Electronics (ACE)	P	P	P	
Star Tracker	P	P	P	P
Transfer Orbit Earth Sensor (TOES)			P	P
Hemispherical Inertial Ref Unit (HIRU)	P	P	P	P
Transfer Orbit Sun Sensor (TOSS)				
Precision Sun Sensor (PSS)				
Reaction Wheel Assembly (RWA) (incl. Fasteners)	P	P	P	P
Aquisition Sun Sensor (ACSS)				
Angle Displacement Sensor (ADS)	P	P	P	
Keyhole Sun Sensors (KSS)				
Solar Array Drive (SAD) (incl. ECRA)			P	
X-Ray Positioner (XRP)			P	
Omni Deployment Actuator (ODA)				
Solar Array Actuator (SAA)				
Solar Array Hinges				
<b>Electrical Power Subsystem</b>				
Integrated Power Controller (IPC)	P, A*	P	P, A*	
Bus Power Distribution Unit (BPDU)	P	P	P	
Payload Power Distribution Unit (PPDU)	P	P	P	
Battery (3 Packs)				
8 Section Switch				
Solar Array				
<b>Propulsion Subsystem</b>				
Helium Tank				
Propellant Tank				
2 lbf Thrusters (LTT)				
Latch Valves				
Squib Valves				
Pressure Transducers - High	P	P	P	
Pressure Transducers - Low	P	P	P	
Pressure Regulator Assy				
Fill and Drain Valve (1/4" pressurant)				
Fill and Drain Valve (1/4" fuel)				
Fill and Drain Valve (1/4" oxidizer)				
Fill and Drain Valve (3/8" fuel)				
Fill and Drain Valve (3/8" oxidizer)				
Check Valve				
Liquid Filter - system				
Liquid Filter - LAM				
Gaseous Helium Filter				
Liquid Apogee Motor (LAM)				

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**Table 1 Contract Data Requirement List**

DATA ITEM	TITLE	SUBMISSION					HARD COPY DIST. CODE			TOTAL HARD COPIES
		A/I	FREQ	INITIAL	SUBSEQUENT	MEDIA	A	B	C	
SDA-3.2.12-02	Software Design Document	I	U/AR	Software PDR	a) 8 b) Software CDR + 90 days c) Conclusion of software testing d) Final @ PSR	11	4	1	20	25
SDA-3.2.12-03	Software Test Plan	I	U/AR	7	8	11	4	1		5
SDA-3.2.12-04	Software Test Procedures	I		8(Prelim)	Software Test Readiness + 60 days	11	4	1		5
SDA-3.2.12-05	Software Test Report	I		Final copy at conclusion of software formal qualification (acceptance) testing		11	4	1		5
SDA-3.2.12-06	Version Description Document	I		Deliver with each build or version of the software		11	4	1		5
SDA-3.2.12-07	Software User & Maintenance Manual	I	U/AR	Prelim: Completion of software testing	Final: S/C PSR	11	4	1		5
	SUBSYSTEM DESIGN & ANALYSIS (Cont)									

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Notes: 1. Contract Award  
2. 75 days after Contract Start Date  
3. 30 days after Contract Award

4. 14 days prior to PDR  
5. 14 days prior to CDR  
6. Spacecraft Pre-Ship Review

7. Subsystem PDR  
8. Subsystem CDR  
9. HC  
10. EC

11. HC & EC  
12. Standard Contractor Processes/  
Procedures (Data Pkg. 14 days prior)  
13. Once Per Launch Vehicle Design

A/I - Approval/Information

U/AR - Update as Required

HC/EC - Hardcopy/Electronic copy

\* - Review Copies

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		A/I	FREQ	INITIAL	SUBSEQUENT	MEDIA	A	B	C	
	SUBSYSTEM DESIGN & ANALYSIS (Cont)									
SDA-3.2.12-08	Firmware Support Manual	I	U/AR	Prelim: 8	Final: Software Test Readiness Review	11	4	1		5
SDA-3.2.12-09	Attitude Control Subsystem Algorithms Document	I	U/AR	7	8	11	4	1		5
SDA-3.2.12-10	Electrical Power & Distribution Subsystem Algorithms Document	I	U/AR	7	8	11	4	1		5
SDA-3.2.12-11	Flight Computer Design Description	I	U/AR	4	5	11	4	1		5
SDA-3.2.12-12	Software Management, Development, and Assurance Plan (SMDAP)	I	U/AR	Proposal	Software Requirements Review	11	4	1	20	15
SDA-3.2.13-01	Spacecraft Emulator Design Document	I	U/AR	Software CDR	Prelim: Delivery of S/C Emulator Final: 60 days after receipt of review comments on Prelim. Documentation	11	4	1	20	25
SDA-3.2.13-02	Spacecraft Emulator User's Operations and Maintenance Manual	I	U/AR	7	Emulator deliv. + 1 month	11	4	1		5
SDA-3.2.14-01	SEM Data & Calibration Handbook	I	U/AR	5, 6 for GOES-N	Updated for each s/c	11	4	1		5
	SUBSYSTEM DESIGN & ANALYSIS (Cont)									

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CCR 610  
MOD 43

Notes: 1. Contract Award  
2. 75 days after Contract Start Date  
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		A/I	FREQ	INITIAL	SUBSEQUENT	MEDIA	A	B	C	
	INTEGRATION AND TEST									
I&T-3.4.4-01	Spacecraft Test Procedures	I	U/AR	30 days prior to use	U/AR	11	3	1		4
I&T-3.4.4-02	Spacecraft Test Data Package	I		Following GOES-N S/C I & T Activity	Following GOES O/Q S/C I&T activity	11		1		1
I&T-3.4.4-03	Performance Verification Reports	I		30 days after GOES-N test activity	30 days after GOES-O/Q I&T activity	11	4	1		5
I&T-3.4.6-01	Launch Site Integration Plan	I	Per Mission	4, 5, <u>interim @ L-12 mo.</u>	U/AR5 <u>Final @ L-3 mo.</u>	11	4	1		5
I&T-3.4.6-02	Launch Commit Criteria	I	Per Mission	5, <u>interim at PER</u>	<u>Final @ L-3 mo.</u>	11	4	1		5
I&T-3.4.6-03	Launch Site Test Procedures	A	Per Mission	60 days prior to PSR	U/AR	11	3	1		4
I&T-3.4.6-04	Ground Operations Plan	A		45 days prior to PDR	a) 45 days prior to CDR b) <u>final @ L-3 mo.</u>	11	3	1		4
I&T-3.4.6-05	Missile System Pre-Launch Safety Package	A	Per Mission	45 days prior to PDR	a) 45 days prior to CDR b) <u>final @ L-3 mo.</u>	11	3	1		4
I&T-3.4.9-01	Transportation & Handling Plan & Procedures	I	U/AR	5, <u>interim @ L-12 mo.</u>	<u>Final @ L-3 mo.</u>	11	4	1		5
I&T-3.4.10-01	Ground Storage Plan	I	U/AR	5	6	11	4	1		5

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Notes: 1. Contract Award  
2. 75 days after Contract Start Date  
3. 30 days after Contract Award

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AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1

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2. AMENDMENT/MODIFICATION NO.

Forty-Four (44)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 See Page 2

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X

d. OTHER (Specify type of modification and authority)  
Unilateral Modification; Clause H.6 LIMITATION OF FUNDSE. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$24,240,251 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)

BY

(Signature of Contracting Officer)

8/14/00

1. In Clause H.6, increase the funding from \$211,783,969 by \$24,240,251 to \$236,024,220. The period of allotment is from the effective date of the contract through February 28, 2001 in accordance with the contractor's correspondence dated August 11, 2000.

2. Block 12 Accounting and Appropriation Data:

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PCN: 415-54768A(1C)	415-54770A(1C)
JON: 415-616-41-81-11	415-616-41-81-11
APP: 800/10110(00)	800/10110(00)
BLI: A705	A707
OC: 41-2550	41-2550
AMT: \$298,448	\$23,941,803

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 44  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

---

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$236,024,220 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:

**SECTION H OF NAS5-98069  
MODIFICATION NO. 44  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract; anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until February 28, 2001.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT1. CONTRACT ID CODE  
N/APAGE OF  
1 22. AMENDMENT/MODIFICATION NO.  
Twenty-Five (45)3. EFFECTIVE DATE  
See Block 16C4. REQUISITION/PURCHASE REQ. NO.  
See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY CODE  
NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 200717. ADMINISTERED BY (If other than Item 6) CODE  
NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X 10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.ACCOUNTING AND APPROPRIATION DATA (If required)  
C: BX B/NC: 427 See Page 213. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)(x) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE  
CONTRACT ORDER NO. IN ITEM 10A.B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office,  
Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X d. OTHER (Specify type of modification and authority)  
Unilateral Modification; Clause H.6 LIMITATION OF FUNDSE. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$4,104,000 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)  
J.T. Felicita, Manager, NASA Contracts16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)  
Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

BY Sandra Marshall  
(Signature of Contracting Officer)9/20/00

(Signature of person authorized to sign)

1. In Clause H.6, increase the funding from \$236,024,220 by \$4,104,000 to \$240,128,220. The period of allotment is from the effective date of the contract through March 19, 2001 in accordance with the contractor's correspondence dated September 15, 2000.

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2. Block 12 Accounting and Appropriation Data:

PCN: 415-54781A(1C)  
JON: 415-616-41-81-11  
APP: 800/10110(00)  
BLI: A708  
OC: 41-2550  
AMT: \$4,104,000

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 45  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

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**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$240,128,220 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:

**SECTION H OF NAS5-98069  
MODIFICATION NO. 45  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until March 19, 2001.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate



AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1

2

AMENDMENT/MODIFICATION NO.

Forty-Six (46)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

FACILITY CODE

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.

NAS5-98069

10B. DATED (SEE ITEM 13)

01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

APC: BX B/NC: 427 See Page 2

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X

d. OTHER (Specify type of modification and authority)

Unilateral Modification; Clause H.6 LIMITATION OF FUNDS

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$15,500,093 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

BY Sandra Marshall  
(Signature of Contracting Officer)

16C. DATE SIGNED

10/24/00

(Signature of person authorized to sign)

1. In Clause H.6, increase the funding from \$240,128,220 by \$15,500,093 to \$255,628,313. The period of allotment is from the effective date of the contract through May 16, 2001 in accordance with the contractor's correspondence dated October 19, 2000.

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2. Block 12 Accounting and Appropriation Data:

PCN: 415-02642A(1C)	415-02641A(1C)
JON: 415-616-41-81-11	415-616-41-81-11
APP: 800/10110(00)	801/20110(01)
BLI: A702	A701
OC: 41-2550	41-2550
AMT: \$500,093	\$15,000,000

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 46  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$255,628,313 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:

**SECTION H OF NAS5-98069  
MODIFICATION NO. 46  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until May 16, 2001.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

OMB APPROVAL #: 2700-0042

AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT		1. CONTRACT ID CODE N/A		PAGE OF 1 3	
2. AMENDMENT/MODIFICATION NO. Forty-Seven (47)		3. EFFECTIVE DATE See Block 16C		4. REQUISITION/PURCHASE REQ. NO. See Block 12	
5. PROJECT NO. (If applicable)		7. ADMINISTERED BY (If other than Item 5)		CODE	
ISSUED BY NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		CODE		NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE	FACILITY CODE
(X) 9A. AMENDMENT OF SOLICITATION NO.	9B. DATED (SEE ITEM 11)
X 10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

## ACCOUNTING AND APPROPRIATION DATA (If required)

BX B/NC: 427 Sec Page 2

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14 (X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: 52.243-1 Changes Fixed-Price - Alt. II
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification revises Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, as reflected in Configuration Change Request (CCR) 4244, as partial consideration for the Risk Reduction Proposal CCR 4226.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J.T. Felicita, Manager, NASA Contracts		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall	
15B. CONTRACTOR/OFFEROR <i>J.T. Felicita</i> (Signature of person authorized to sign)	15C. DATE SIGNED 11/15/00	16B. UNITED STATES OF AMERICA BY <i>Sandra Marshall</i> (Signature of Contracting Officer)	16C. DATE SIGNED 11/28/00

7540-01-152-8070

30-105

STANDARD FORM 30 (Rev. 10-83)

PREVIOUS EDITION UNUSABLE

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**1. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, make the following changes:**

Decrease N13, Flight Software Test Readiness Review (SWTRR) from \$7,100,000 to \$2,000,000 and change the date from 11/13/00 to 1/31/01.

Decrease N57, Gate 9 – GOES N Bus Complete from \$2,000,000 to \$1,000,000 and change the date from 11/28/00 to 12/31/00.

Decrease O8, GOES O SWTRR (if required), from \$7,000,000 to \$2,000,000 and change the date from 11/13/00 to 1/31/01.

Decrease N05, GOES N Pre-Environmental Review (PER) from \$7,000,000 to \$1,000,000.

Decrease N61, Complete GOES N Fit Check from \$2,000,000 to \$1,000,000.

Decrease O33, XRS/EUV/EPS/HEPAD Flight Unit #2 (N-O Spares) PER from \$6,500,000 to \$1,500,000.

Decrease O34, Gate 12 – GOES O S/C to System Test from \$10,000,000 to \$1,000,000.

Add N79, 1<sup>st</sup> Powered Testing of GOES N Bus Module, \$10,000,000, 11/08/00.

Add N80, HSE Delivery to ITT for RTP Checkout, \$3,100,000, 11/01/00.

Add O37, Gate 7U.5 – GOES O Bus Propulsion Subsystem Complete, \$9,500,000, 11/15/00.

Add O38, Gate 11 – GOES O Antenna to Integration, \$9,500,000, 10/30/00.

**2. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment K, Performance Based Payments Completion Criteria

Add the following as a Gate and Gate Criteria for Product Delivery Gates:

<u>No.</u>	<u>Title</u>	<u>Generic Description</u>
7U.5	Bus Propulsion Subsystem, Liquid and XIP's Complete	1. Propulsion installed on Bus and ATP's complete. 2. Propulsion Ordnance installed per MOU requirements. 3. Propulsion hardware documentation from vendors complete (qualification data, unit test data, calibration data, etc.)

Change milestone N51 to RESERVED. This is a correction that should have occurred under modification number 13.

Add item N79, 1<sup>st</sup> Powered Testing of GOES N Bus Module, with a completion criteria of 6.

Add item N80, HSE Delivery to ITT for RTP Checkout with a completion criteria of 6.

Add item O37, gate 7U.5 – GOES O Bus Propulsion Subsystem Complete, with a completion criteria of 5.

Add item O38, Gate 11 – GOES O Antenna to Integration, with a completion criteria of 5.

**3. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 11-12

Page 14-16

Page 18-19

Attachment K

Page 2-5

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents partial consideration for the work associated with CCR 4226. If CCR 4226 is not issued and definitized by December 31, 2000, the changes made by this modification shall be cancelled and any advance payments made as a result of this modification shall be credited back to the government in future payments.

END OF MODIFICATION

**SECTION B OF NAS5-98069  
MODIFICATION NO. 47  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N60.	Spacecraft Training Program Plan (Final)	\$8,000,000	11/28/00
N61.	Complete Fit Check	\$1,000,000	12/1/00
N62.	GOES N End-to-End Test 2 Completed	\$4,000,000	1/26/01
N63.	Launch Site Test Procedures	\$4,000,000	3/19/01
N64.	INR System Description and Analysis Document (Final)	\$4,000,000	4/27/01
N65.	Contingency Simulation # 1	\$4,000,000	8/2/02
N66.	Dress Rehearsal	\$3,000,000	9/13/02
N67.	GOES-N Data Book	\$10,000,000	10/08/00
N68.	GOES-N End-to-End Test 4 Completed	\$3,000,000	5/14/01
N69.	Algorithm Design Description – Build 3	\$4,000,000	1/20/99
N70.	1553 Data Bus Diagnostics Features Meeting	\$2,000,000	2/11/99
N71.	PES ADD Walk-Thru Review	\$2,000,000	7/15/99
N72.	PES Prototype GUI Demo	\$2,000,000	7/15/99
N73.	PES Delivery	\$500,000	10/15/99
N74.	Wideband Tape Recorder Delivery & Training	\$470,000	3/31/00
N75.	Safehold Mode Proposal	\$24,471	3/15/00
N76.	Electronic Data Distribution System & Configuration Management Review	\$2,000,000	5/10/00
N77.	Rebaseline Schedule Review	\$6,000,000	5/11/00
N78.	Integration and Test (I&T) Review	\$5,000,000	6/15/00
N79.	1 <sup>st</sup> Powered Testing of GOES N Bus Module	\$10,000,000	11/8/00



**SECTION B OF NAS5-98069  
MODIFICATION NO. 47  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N80.	HSE Delivery to ITT for RTP Checkout	\$3,100,000	11/01/00
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**GOES O**

**Spacecraft System Level Reviews**

O1.	Critical Design Review	\$2,000,000	2/11/00
O2.	Mission Operations Review	\$10,000,000	4/2/02
O3.	Pre-Environmental Review	\$10,000,000	4/18/02
O4.	Pre-Storage Review	\$12,000,000	12/11/02
O4A.	Pre-Shipment Review	\$1,000,000	12/11/03
O5.	Flight Operations Review	\$1,000,000	1/9/04
O6.	Spacecraft Launch Readiness Review	\$1,000,000	4/4/04

**Software Subsystem Reviews**

O7.	Critical Design Review	\$4,500,000	9/27/99
O8.	Test Readiness Review	\$2,000,000	1/31/01
O9.	Acceptance Review	\$2,000,000	3/13/00

**Launch Services**

O10.	Launch Vehicle Interface Requirements Document	\$2,500,000	12/20/99
O11.	Spacecraft/Launch Vehicle Interface Control Document	\$2,100,000	1/27/00
O12.	Mission Integration Program Kickoff Review	\$2,500,000	8/11/99
O13.	Final Loads Verification Review	\$10,000,000	5/30/02
O14.	Launch Vehicle Requirements Review	\$5,000,000	12/16/99

**SECTION B OF NAS5-98069  
MODIFICATION NO. 47  
SUPPLIES OR SERVICES AND PRICES/COSTS**

O30.	Gate 9 - Bus Complete	\$1,000,000	8/24/00
O31.	Gate 10 - Payload Complete	\$4,000,000	1/16/01
O32.	Bus & SEM Instruments Integration & Test Complete	\$13,000,000	1/16/01
O33.	XRS/EUV/EPS/HEPAD Flight Unit #2 (N-O Spares) Pre-Shipment Review	\$1,500,000	12/07/01
O34.	Gate 12 - GOES O S/C to System Test	\$1,000,000	4/03/02
O35.	Gate 13 - GOES O S/C Complete	\$12,000,000	1/07/03
O36.	GOES-O End-to-End Test 4 Completed	\$2,000,000	12/05/02
O37.	Gate 7U.5 - GOES O Bus Propulsion Subsystem Complete	\$9,500,000	11/15/00
O38.	Gate 11 - GOES O Antenna to Integration	\$9,500,000	10/30/00

**GOES P**

**Spacecraft System Level Reviews**

P1.	Critical Design Review	\$3,750,000	2/6/04
P2.	Mission Operations Review	\$4,000,000	4/5/05
P3.	Pre-Environmental Review	\$4,000,000	7/5/05
P4.	Pre-Shipment Review	\$2,400,000	11/29/05
P5.	Flight Operations Review	\$2,400,000	1/12/06
P6.	Spacecraft Launch Readiness Review	\$2,300,000	4/4/06

**Software Subsystem Reviews**

P7.	Critical Design Review	\$7,000,000	11/4/03
P8.	Test Readiness Review	\$3,750,000	12/30/03

**SECTION B OF NAS5-98069  
MODIFICATION NO. 47  
SUPPLIES OR SERVICES AND PRICES/COSTS**

P9.	Acceptance Review	\$3,750,000	3/2/04
Launch Services			
P10.	Launch Vehicle Interface Requirements Document	\$3,750,000	11/28/03
P11.	Spacecraft/Launch Vehicle Interface Control Document	\$4,000,000	1/5/05
P12.	Mission Integration Program Kickoff Review	\$7,000,000	10/8/03
P13.	Final Loads Verification Review	\$4,000,000	7/29/05
P14.	Launch Vehicle Requirements Review	\$7,500,000	11/3/04
P15.	Launch Vehicle Pre-Installation Review (Major Components)	\$4,000,000	8/25/05
P16.	Launch Vehicle Design Certification Review	\$5,000,000	10/5/05
P17.	Launch Vehicle Pre-Ship Review	\$5,000,000	10/19/05
P18.	Booster on Stand (BOS) Review	\$2,400,000	1/4/06
P19.	Pre-Payload Mate Review	\$2,400,000	3/17/06
P20.	Launch Vehicle Mission Peculiar/ Mission Unique Preliminary Design Review	\$3,750,000	4/7/04
P21.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$7,500,000	10/6/04
P22.	Launch Vehicle Component/ System Design Review (Major Mods only) (PDR Level)	\$3,750,000	6/30/04

No.	Title	Generic Description
4	Payload Module Layout Complete	The physical definition of the payload module is complete including all unit definition, unit locations, harness configuration, coax routing, waveguide routing, antenna tie downs, etc. The payload layout drawings are complete.
5	Antenna Design Complete	The electrical design and mechanical configuration are defined. All interfaces to the payload and bus (waveguide, coax, tie-downs, pyrotechnic devices) are complete. Antenna drawings are released.
6	Critical Design Review	CDR marks the point in the program where the design is considered to be complete and captured in released hardware drawings.
		Indicates the manufacturing/build process is ready to commence.
7	Start Bus Module Integration	Corresponds to the point at which the bus structure/propulsion module, harness and units are complete and ready for bus integration.
7U5	Bus Propulsion Subsystem, Liquid and XIP's Complete	<b>1. Propulsion installed on Bus and ATP's complete.</b> <b>2. Propulsion Ordnance installed per MOU requirements.</b> <b>3. Propulsion hardware documentation from vendors complete (qualification data, unit test data, calibration data, etc.)</b>
8	Start Payload Module Integration	Corresponds to the point at which the payload structure, harness, and units are complete and ready for payload integration.
9	Bus Module Complete	Corresponds to the completion of the bus module integration and test, all test and process anomalies must be closed, indicating the bus module is ready for integration at the next level.
10	Payload Module Complete	Corresponds to the completion of the payload module integration and test, all test and process anomalies must be closed, indicating the payload module is ready for integration at the next level.
11	Antenna to Integration	Corresponds to completion of antenna range testing and completed mechanical assembly of the antenna system. This is when the antenna system is ready for installation on the satellite.
12	Satellite to System Test	The satellite is delivered to Hi-bay for system test.
13	Satellite Complete	The satellite is mechanically complete, except for operations that must be conducted at the launch site. All system level testing is complete. All process and test anomalies are resolved and closed. The paperwork tracking the satellite configuration and test status is complete.
14	Launch	All final satellite preparations are complete and configured for launch, the mission control center and remote tracking sites are ready for operations.
15	Ground System Design Complete	Hardware and software designs complete, site ready and facility specification complete.

No.	Title	Generic Description
16	Start Ground System Integration	The ground system hardware and satellite operating software is delivered.
17	Ground System Complete	The ground system hardware and software are complete, installed at the customer site, and the site acceptance testing is complete, with all anomalies resolved and closed.
18	Mission Complete	The transfer orbit and in-orbit test operations are complete. All anomalies are resolved, The satellite is configured for on-station operations.

**GOES N**

Milestone	Description	Completion Criteria
N2A.	Preliminary Design Review Updates	1
N37A.	EDDS Hardware / Software Interface	1
N41.	GOES N and O Team Kickoff	1
N42.	Contract Award to Panametrics for SEM Instruments	2
N43.	Deliver Engineering Communications Model Data	3
N44.	S/C Emulator & PES PDR	1
N45.	Gate 3 - GOES Bus Layout Complete	5
N46.	Gate 5 - GOES Antenna Design Complete	5
N47.	RESERVED	
N48.	GTACS/NTACTS Proof-of-Concept Demo	6
N49.	Gate 4 - GOES Payload Layout Complete	5
N50.	Communication Subsystem CDR	1
N51.	<b>RESERVED</b>	
N52.	Version Description Document - Build 4	3
N53.	RESERVED	
N54.	Deliver Flight Communications Model Data	4
N55.	Gate 7 - Start Bus Integration	5
N56.	Deliver Ground System SOCC/CDASs	4
N57.	Gate 9 - Bus Complete	5
N58.	GOES N End-to-End Test 1A Completed	6
N59.	Flight Operations Training Program Completed	6
N60.	Spacecraft Training Program Plan (Final)	3
N61.	Complete Fit Check	6
N62.	GOES N End-to-End Test 2 Completed	6
N63.	Launch Site Test Procedures	3
N64.	INR System Description and Analysis Document (Final)	3
N65.	Contingency Simulation # 1	6
N66.	Dress Rehearsal	6

**GOES N**

N67.	GOES N Data Book	6
N68.	GOES N End-to-End Test 4 Completed	6
N69.	Algorithm Design Description – Build 3	6
N70.	1553 Data Bus Diagnostics Features Meeting	6
N71.	PES ADD Walk-Thru Review	1
N72.	PES Prototype GUI Demo	6
N73.	PES Delivery	4
N74.	Wideband Tape Recorder Delivery & Training	6
N75.	Safehold Mode Proposal	6
N76.	Electronic Data Distribution System & Configuration Management Review	1
N77.	Rebaseline Schedule Review	1
N78.	Integration and Test (I&T) Review	1
N79.	<b>1<sup>st</sup> Powered Testing of GOES N Bus Module</b>	<b>6</b>
N80.	<b>HSE Delivery to ITT for RTP Checkout</b>	<b>6</b>

**GOES O**

Milestone	Description	Completion Criteria
O29.	Gate 7 - Start Bus Integration	5
O30.	Gate 9 - Bus Complete	5
O31.	Gate 10 - Payload Complete	5
O32.	Bus & SEM Instruments Integration & Test Complete	6
O33.	XRS/EUV/EPs/HEPAD Flight Unit#2 (N-O Spares) Pre-Shipment Review	1
O34.	Gate 12 - GOES O S/C to System Test	5
O35.	Gate 13 - GOES O S/C Complete	5
O36.	GOES O End-to-End Test 4 Completed	6
O37	<b>Gate 7U.5 – GOES O Bus Propulsion Subsystem Complete</b>	<b>5</b>
O38	<b>Gate 11 – GOES O Antenna to Integration</b>	<b>5</b>

**GOES P**

Milestone	Description	Completion Criteria
P29.	Kickoff Meeting	1
P30.	Deliver Launch Services Proposal	3

**GOES P**

P31.	Manufacturing Readiness Review	1
P32.	Preliminary Design Review (If req'd)	1
P33.	Transfer SEM instruments from precontractual stores	6
P34.	Communication Subsystem to Integration	6
P35.	T&C Subsystem to Integration	6
P36.	Gate 11 - Antenna to Integration	5
P37.	ACS Subsystem to Integration	6
P38.	Gate 9 - Bus Complete	5
P39.	Bus & SEM Instruments Integration & Test Complete	6
P40.	S/C Unit Integration Complete	6
P41.	SEM Instruments Integration & Test	6
P42.	Gate 12 - S/C to System Test	5
P43.	GFE Integration	6
P44.	Complete EMI/EMC Test	6

**GOES Q**

Milestone	Description	Completion Criteria
Q29.	Kickoff Meeting	1
Q30.	Deliver Launch Services Proposal	3
Q31.	Manufacturing Readiness Review	1
Q32.	Preliminary Design Review (If req'd)	1
Q33.	Transfer SEM instruments from precontractual stores	6
Q34.	Communication Subsystem to Integration	6
Q35.	T&C Subsystem to Integration	6
Q36.	Gate 11 - Antenna to Integration	5
Q37.	ACS Subsystem to Integration	6
Q38.	Gate 9 - Bus Complete	5
Q39.	Bus & SEM Instruments Integration & Test Complete	6
Q40.	S/C Unit Integration Complete	6
Q41.	SEM Instruments Integration & Test	6
Q42.	Gate 12 - S/C to System Test	5
Q43.	GFE Integration	6
Q44.	Complete EMI/EMC Test	6

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 3

2. AMENDMENT/MODIFICATION NO.

Forty-Eight (48)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:  
Clause 52.243-1 Changes Fixed Price—Alt. II

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4222, 6074, 6081, 6084A, 6099, 6108, 6112, 6118, 6126, 6128, 7028A, 7033B, 7036, 7039, 8037, 8038, 8039A, 8040A and 8041 at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

  
(Signature of person authorized to sign)

15C. DATE SIGNED

4/24/01

16B. UNITED STATES OF AMERICA

BY

  
(Signature of Contracting Officer)

16C. DATE SIGNED

4/25/01

NSN 7540-01-152-8070

30-105

PREVIOUS EDITION UNUSABLE

STANDARD FORM 30 (Rev. 10-83)

Prescribed by GSA



**In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment B, Performance Specification, Appendix A, Deviation and Waiver Requests

In 10.11.3, note the aluminum foil tape change as reflected in CCR 6074.

In 10.11.3, note the halocarbon grease change as reflected in CCR 6081.

In 10.11.3, note the Dowkey Switch materials change as reflected in CCR 6099.

In table 3.4.7.2.1 and 3.4.7.2.2, note the radiated emission change as reflected in CCR 6108.

Attachment C, GOES N-Q Imager Interface Control Document

Correct signal characteristics tables 3.5.4-1, 3.5.4-2, 3.5.4-3, 3.5.4-6, 3.5.4-7, 3.5.4-8, 3.5.4-10 and 3.5.4-11 as reflected in CCR 6084A.

Correct a typographical error to table 3.5.1-5 as reflected in CCR 6112. This was originally changed under modification number 41, CCR 6068.

Increase the radiated emissions limit as reflected in CCR 7028A.

Update power table 3.4.2-4 as reflected in CCR 7033B.

Modify 3.5.1.3.4 to address an unstated operations capability pertaining to the proportional commands as reflected in CCR 7036.

Correct table 3.5.1-5, Proportional Command Data Strobe Signal Characteristics as reflected in CCR 7039.

Attachment D, N-Q Sounder Instrument Interface Control Document

Correct signal characteristics tables 3.5.4-1, 3.5.4-2, 3.5.4-3, 3.5.4-6, 3.5.4-7, 3.5.4-8, 3.5.4-10 and 3.5.4-11 as reflected in CCR 6084A.

Change the filter wheel cooler heat flux as reflected in CCR 6126.

Increase the radiated emissions limit as reflected in CCR 7028A.

Update power table 3.4.2-4 as reflected in CCR 7033B.

Modify 3.5.1.3.4 to address an unstated operations capability pertaining to the proportional commands as reflected in CCR 7036.

Correct table 3.5.1-5, Proportional Command Data Strobe Signal Characteristics as reflected in CCR 7039.

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Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

Revise section 2.2.1 and 3.3.2.4-6 to add the as-built harness drawings as reflected in CCR 4222.

Note the change from Kern to Glenair backshells as reflected in CCR 6128.

Correct the typographical error to the MDL interface reference in 3.4.5.6.1 as reflected in CCR 8037.

Modify Appendix A figures A-1, A-3, A-4, A-5, A-6, A-7, A-8 and A-9 as reflected in CCR 8039A.

In 2.2.2, update the PEB, DEB, and HEB I/F drawings as reflected in CCR 8040A.

Attachment L, Interface Control Document for the SXI Ground Support Equipment

Update this document to include Revision A changes as reflected in CCR 6118

Delete documents from 2.2.2 as reflected in CCR 8038.

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT/D CODE

N/A

PAGE OF

1 7

2. AMENDMENT/MODIFICATION NO.

Forty-Nine (49)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

6. ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NASS-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

2. ACCOUNTING AND APPROPRIATION DATA (If required) PCN: 415-5476(AIC) APP: ECC/10110 (CC)  
PPC: BX B/NC: 427 -See Page 2 PCN: 415-5476-41-21-11 B/L: A706 CC: 41-2550

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:  
52.243-1 Changes Fixed-Price - Alt. II

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Request (CCR) 4226C for a firm fixed price of \$38,365,633.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

J.T. Felicita  
(Signature of person authorized to sign)

15C. DATE SIGNED

3/14/01

16B. UNITED STATES OF AMERICA

BY

Sandra Marshall  
(Signature of Contracting Officer)

16C. DATE SIGNED

3/15/01

**1. In Clause B.1 DELIVERABLE REQUIREMENTS, change the price to the following Contract Line Items:**

<u>CLIN</u>	<u>Description</u>	<u>Price</u>
1.	On-Orbit Acceptance of GOES N Spacecraft	\$312,978,539
<hr/>		
11.	On-Orbit Acceptance of GOES O Spacecraft	\$148,981,565

**2. Increase Clause B.2 FIRM FIXED PRICE as follows:**

<u>From</u>	<u>By</u>	<u>To</u>
\$423,594,471	\$38,365,633	\$461,960,104

**3. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, change and add events as reflected in the change pages.**

**4. In Clause F.1 DELIVERY SCHEDULE, change the delivery date for item number 3a., Software Development & Validation Environment from GOES N ESD-3 mos. to April 2002.**

**5. In Clause F.2 ENGINEERING HANDOVER DATES AND STORAGE DATES, change the earliest storage date for GOES N to January 1, 2002 and change the engineering handover date for GOES N to January 31, 2003.**

**6. In Clause H.3 PRE-DETERMINED ADJUSTMENT FOR LATE DELIVERY, replace the first paragraph with the following:**

(a) If the engineering handover date, as defined in the contract schedule, is delayed by more than one hundred twenty (120) days for GOES N, more than ninety (90) days for GOES O, or more than thirty (30) days for either GOES P or GOES Q by the contractor, the contractor shall pay to the Government, for each calendar day of delay, beginning with the one hundred twenty first day for GOES N, ninety-first day for GOES O or thirty-first day for any subsequent spacecraft, from the originally specified

engineering handover date until the actual engineering handover date of said spacecraft, the sum of \$50,000, up to a maximum of \$ \*, for each spacecraft. The form of payment, whether a contract credit or otherwise, will be determined by the Contracting Officer. The prices in this paragraph may be impacted by Clause H.16.

\*GOES N = \$5,000,000 and GOES O, P & Q = \$2,000,000 each

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**7. Add Clause H.22 ADVANCE AGREEMENT FOR CHANGES TO  
ADDITIONAL SPACECRAFT**

When NASA exercises its options under Clause H.1, OPTION FOR ADDITIONAL SPACECRAFT, the technical changes arising from Configuration Change Request (CCR) 4226C will have been incorporated into the specification; no additional change order will be necessary to apply the requirements of CCR 4226C to the additional spacecraft. However, as a result of the changes made to the specification, the prices of each optional spacecraft will increase by the following amounts:

Option 1. GOES P    \$547,938

Option 2. GOES Q    \$580,330

These adjustments will constitute full and equitable adjustment for all changes made under CCR 4226C and Modification 49. The contractor agrees that when each option is exercised, the contractor will release the Government from further claims arising from CCR 4226C for the additional spacecraft.

All other terms and conditions of the contract remain in effect for these options.

(End of Clause)

**8. Add Clause H.23 ADVANCE AGREEMENT FOR LAUNCH SERVICES  
ESCALATION COSTS**

The fixed price of this contract may receive a one-time adjustment for escalation costs associated with equitable adjustment of the engineering handover date for GOES N. The Contractor shall submit a proposal for the escalation costs only associated with adjusting the engineering handover date from October 31, 2002 to January 31, 2003. The price of GOES N may be increased by the amount of the equitable adjustment to be definitized after receipt of the proposal but not to exceed \$999,000. The Contractor shall assert the right to submit this proposal no later than July 31, 2001.

(End of Clause)

**9. In Clause J.1 LIST OF ATTACHMENTS, change Attachment A, Statement of Work, Attachment B, Performance Specification, Attachment G Contract Document Requirements List, Attachment I, Program Review Requirements and Attachment K, Performance Based Payments Completion Criteria as reflected in CCR 4226C.**

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**~~Attachment J, Small, Small Disadvantaged and Women-Owned Small Business~~**  
**Subcontracting Plan is revised to reflect new numbers based on this negotiation.**  
**These numbers are reflected in the revised pages.**

**10. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 3  
Page 4  
Page 5  
Page 6  
Page 11  
Page 12  
Page 15  
Page 16  
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Page 19  
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Page 44  
Page 61  
Page 62

Attachment A, Statement of Work

Table 1.1

Section 1.3.1

Section 1.3.1.1

Section 1.3.1.2

Section 2.4

Section 3.2.16.2

Section 3.2.16.3

Section 3.3.5

Section 3.3.13

Section 3.4.3.4

Section 3.4.3.5.1

Section 3.4.4.3

Section 3.4.4.3.1

Section 3.4.4.3.2

Section 3.4.4.3.3

Section 3.4.4.3.3.1

Section 3.4.4.3.3.2

Section 3.4.4.3.4

Section 3.4.5.3

Section 3.4.11

Section 3.5.1

Section 3.5.3.3

Section 3.5.4.1

Table 3.5.4.1.1

Section 3.5.4.2

Section 3.5.5

Section 3.6.1.1

Section 3.6.2.3

Table 3.6.2.3-1

Section 3.6.2.3.2.2.1

Section 3.6.2.3.2.3.1

Section 3.6.2.3.2.4

Section 3.6.2.4

Section 3.6.2.4.1

Section 3.6.2.6

Section 3.6.2.7

Section 3.6.2.8

Section 3.6.4.1

Section 3.6.5.1

Section 3.10

Section 3.10.1

Attachment A, Statement of Work, (cont.)

Section 3.10.1.1

Table 3.10.1.1

Table 3.10.1.2

Section 3.10.1.2

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Attachment B, Performance Specification

Section 7.1.7

Section 7.1.8

Section 7.2.1

Section 7.2.2

Section 7.2.3

Section 7.2.4

Section 8.7.2.3

Attachment B, Performance Specification, cont.

Section 10.5.4.2

Section 10.5.4.2.1

Section 10.5.4.2.2

Section 11.3.1.6

Attachment G, Contract Document Requirements List

Table 1

SE-2.1-04

SE-2.1-07

SE-2.4-01

SE-2.4-10

SE-2.4-11

SM-3.1.1-01

SDA-3.2.13-02

SFAT-3.3.1-02

I&T-3.4.4-02

I&T-3.4.4-03

OPS-3.6.1-03

OPS-3.6.3-01

OPS-3.6.3-02



Attachment I, Program Review Requirements

Section 1.3.12

Section 1.3.12.1

Section 1.3.13

Section 1.3.13.1

Section 1.8.13.1

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Attachment J, Small, Small Disadvantaged and Women-Owned Small Business  
Subcontracting Plan

Replace in its entirety with version dated December 13, 2000

Attachment K, Performance Based Payments Completion Criteria

Page 1-6

In consideration of the modification(s) agreed to herein as complete equitable adjustments for the CCR listed in Block 14 of page 1 of this modification, the Contractor hereby releases the Government from any and all liability under this contract for further equitable adjustments attributable to such facts or circumstances giving rise to this CCR or any Government oversight or requests for information by NASA or its agents from the inception of this contract through Gate 8 as defined in Attachment K Performance Based payments Completion Criteria (except for Clause H.23).

END OF MODIFICATION

**INDEX OF CLAUSES FOR NAS5-98069  
MODIFICATION NO. 49**

**SECTION H**

- H.1 OPTION FOR ADDITIONAL SPACECRAFT
- H.2 LAUNCH SERVICES
- H.3 PRE-DETERMINED ADJUSTMENT FOR LATE DELIVERY
- H.4 ADDITIONAL GOVERNMENT ACCOMMODATIONS
- H.5 SUBCONTRACTING PLAN AND REPORTS FOR SMALL, SMALL  
DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS CONCERNS  
(GSFC 52.219-90) (JULY 1996)
- H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR  
1989)
- H.7 CONTRACTOR ASSISTANCE
- H.8 INCENTIVE SUBCONTRACTING PROGRAM
- H.9 SECTION H CLAUSES INCORPORATED BY REFERENCE
- H.10 ELECTION OF GOVERNMENT-PROVIDED LAUNCH SERVICES AND ADVANCE  
AGREEMENT FOR DEDUCTIVE CHANGE FOR GOVERNMENT PROVIDED  
LAUNCH SERVICES
- H.11 ADVANCE UNDERSTANDING REGARDING SETTLEMENT OF TERMINATION  
OF CONTRACTOR PROVIDED LAUNCH SERVICES
- H.12 LICENSES AND PERMITS FOR A LAUNCH SERVICE OPERATOR
- H.13 INSIGHT AND GOVERNMENT APPROVAL
- H.14 GOES N REPLACEMENT FOR FIRST YEAR SERVICE FAILURES
- H.15 NO COST TECHNICAL TRADES
- H.16 ADDITIONAL ADJUSTMENTS FOR LATE DELIVERIES
- H.17 RESERVED
- H.18 REVISED DATE FOR LATE INSTRUMENTS
- H.19 ONE TIME SLIP FOR GOES O
- H.20 ADJUSTED GROUND STORAGE RATE FOR GOES N AND O
- H.21 SPECIAL PERFORMANCE REQUIREMENTS
- H.22 ADVANCE AGREEMENT FOR CHANGES TO ADDITIONAL SPACECRAFT
- H.23 ADVANCE AGREEMENT FOR LAUNCH SERVICES ESCALATION COSTS

**SECTION I**

- I.1 LIST OF SECTION I CLAUSES INCORPORATED BY REFERENCE
- I.2 APPROVAL OF CONTRACT (52.204-1) (DEC 1989)
- I.3 RIGHTS TO PROPOSAL DATA (52.227-23) (TECHNICAL) (JUN 1987)
- I.4 SUBCONTRACTS (FIXED-PRICE CONTRACTS) (52.244-1) (FEB 1995)
- I.5 CLAUSES INCORPORATED BY REFERENCE (52.252-2) (JUN 1988)
- I.6 RIGHTS IN DATA--GENERAL (52.227-14) (JUN 1987) as modified by NASA FAR  
Supplement 18-52.227-14--ALTERNATE II (JUN 1987)

**SECTION J**

- J.1 LIST OF ATTACHMENTS (GSFC 52.210-101) (OCT 1988)

**SECTION B OF NAS5-98069**  
**MODIFICATION NO. 49**  
**SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.1 DELIVERABLE REQUIREMENTS (GSFC 52.210-90) (OCT 1988)**

The Contractor shall perform and/or deliver the following:

Contract Line  
Item Number  
(CLIN)

Description

Price

1.	On-Orbit Acceptance of GOES N Spacecraft	\$312,978,539
2.	Propulsion Computer Model & Supporting Documentation	NSP
3.	a. Software Development & Validation Environment b. GTACS Workstation for SXI T&C, I&V and Software Development	NSP
4.	Source & Executable Flight Software Code	NSP
5.	Emulators w/Spare Parts S/C Emulator (2) 3 sets EACE components (1 set includes EACE board, EACE DPM daughter card, EACE PAM board; 3 sets ETC components (1 set includes ETC board and PAM board; 2 special order ovenized oscillators used by EACE	NSP
6.	INR Performance Evaluation System	NSP
7.	SXI to Spacecraft Harness	NSP
8.	Battery Test Cells (5 from each activation lot)	NSP
9.	Data for Communication Modeling Engineering Model Data Flight Model Data	NSP
10.	Acceptance of SSGS	NSP

**SECTION B OF NAS5-98069  
MODIFICATION NO. 49  
SUPPLIES OR SERVICES AND PRICES/COSTS**

11.	On-Orbit Acceptance of GOES O Spacecraft	\$148,981,565
12.	Special Task Assignments with Reports	See Clause B.9
13.	Additional Integration & Testing Support	See Clause H.4
14.	Spacecraft Storage	See Clause H.4

OPTION 1

15.	On-Orbit Acceptance of GOES P Spacecraft	\$190,900,000
16.	Special Task Assignments with Reports	See Clause B.9
17.	Additional Integration & Testing Support	See Clause H.4
18.	Spacecraft Storage	See Clause H.4

OPTION 2

19.	On-Orbit Acceptance of GOES Q Spacecraft	\$185,000,000
20.	Special Task Assignments with Reports	See Clause B.9
21.	Additional Integration & Testing Support	See Clause H.4
22.	Spacecraft Storage	See Clause H.4

Total value of each CLIN, for purposes of final payment shall be reduced by Performance Based Payments made to the contractor for that CLIN.

(End of clause)

**SECTION B OF NAS5-98069  
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SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.2 FIRM FIXED PRICE (18-52.216-78) (DEC 1988)**

The total firm fixed price for this contract is \$461,960,104.

(End of clause)

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**B.3 RESERVED**

**B.4 PERFORMANCE-BASED PAYMENTS (52.232-32) (MAY 1997)**

(a) Amount of payments and limitations on payments. Subject to such other limitations and conditions as are specified in this contract and this clause, the amount of payments and limitations on payments shall be specified in the contract's description of the basis for payment.

(b) Contractor request for performance-based payment. The Contractor may submit requests for payment of performance-based payments not more frequently than monthly, in a form and manner acceptable to the Contracting Officer. Unless otherwise authorized by the Contracting Officer, all performance-based payments in any period for which payment is being requested shall be included in a single request, appropriately itemized and totaled. The Contractor's request shall contain the information and certification detailed in paragraphs (l) and (m) of this clause.

(c) Approval and payment of requests. (1) The Contractor shall not be entitled to payment of a request for performance-based payment prior to successful accomplishment of the event or performance criterion for which payment is requested. The Contracting Officer shall determine whether the event or performance criterion for which payment is requested has been successfully accomplished in accordance with the terms of the contract. The Contracting Officer may, at any time, require the Contractor to substantiate the successful performance of any event or performance criterion which has been or is represented as being payable.

(2) A payment under this performance-based payment clause is a contract financing payment under the Prompt Payment clause of this contract, and approved requests shall be paid in accordance with the prompt payment period and provisions specified for contract financing payments by that clause. However, if the Contracting Officer requires substantiation as provided in paragraph (c)(1) of this clause, or inquires into the status of an event or performance criterion, or into any of the conditions listed in paragraph (c) of this clause, or into the Contractor certification, payment is not required, and the prompt payment period shall not begin until the Contracting Officer approves the request.

(3) The approval by the Contracting Officer of a request for performance-based payment does not constitute an acceptance by the Government and does not excuse the Contractor from

**SECTION B OF NAS5-98069  
MODIFICATION NO. 49  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS**

In accordance with Clause B.4 PERFORMANCE BASED PAYMENTS (52.232-32), and upon successful completion of an event, as defined in B.6 DETERMINATION OF EVENT COMPLETION, the contractor may request performance based payments based for the following Events: (Requests for payment for milestones completed in September after the September request for payment has been submitted and milestones completed in October, will be submitted in November)

<u>Event No.</u>	<u>Event</u>	<u>Amount</u>	<u>Date</u>
<u>GOES N</u>			
Spacecraft System Level Reviews			
N1.	System Concept Review	\$3,750,000	5/5/98
N2.	Preliminary Design Review	\$1,500,000	8/13/98
N2A.	Preliminary Design Review Updates	\$1,000,000	12/20/98
N3.	Critical Design Review	\$6,500,000	5/13/99
N4.	Mission Operations Review	\$2,400,000	5/12/00
N5.	Pre-Environmental Review	\$8,000,000	9/19/00
N6.	Pre-Storage Review	\$4,000,000	5/21/01
N6A.	Pre-Shipment Review	\$5,500,000	5/21/02
N7.	Flight Operations Review	\$4,000,000	6/6/02
N8.	Spacecraft Launch Readiness Review	\$2,000,000	10/5/02

Software Subsystem Reviews

N9.	Concept Review	\$3,000,000	3/5/98
N10.	Requirements Review	\$2,500,000	5/7/98
N11.	Preliminary Design Review	\$1,000,000	7/9/98

**SECTION B OF NAS5-98069  
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N12.	Critical Design Review	\$2,500,000	3/8/99
N13.	Test Readiness Review	\$2,000,000	1/31/01
N14.	Acceptance Review	\$10,000,000	10/14/99

**Spacecraft Support Ground System Reviews**

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N15.	System Concept Review	\$2,500,000	5/7/98
N16.	Preliminary Design Review	\$1,000,000	7/31/98
N17.	Critical Design Review	\$3,000,000	4/9/99
N18.	Pre-Shipment Review	\$9,000,000	3/14/00
N19.	Acceptance Review	\$3,500,000	7/2/03

**Launch Services**

N20.	Launch Vehicle Interface Requirements Document	\$3,750,000	6/22/98
N21.	Spacecraft Launch Vehicle Interface Control Document	\$1,000,000	3/1/99
N22.	Mission Integration Program Kickoff Review	\$1,000,000	8/14/98
N23.	Final Loads Verification Review	\$1,500,000	8/16/00
N24.	Launch Vehicle Requirements Review	\$5,000,000	1/19/99
N25.	Launch Vehicle Pre-Installation Review (Major Components)	\$2,000,000	2/12/02
N26.	Launch Vehicle Design Certification Review	\$3,500,000	8/7/02
N27.	Launch Vehicle Pre-Ship Review	\$2,000,000	4/5/02

**SECTION B OF NAS5-98069**  
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**SUPPLIES OR SERVICES AND PRICES/COSTS**

N60.	Spacecraft Training Program Plan (Final)	\$8,000,000	11/28/00
N61.	Complete Fit Check	\$1,000,000	12/1/00
N62.	GOES N End-to-End Test 2 Completed	\$4,000,000	1/26/01
N63.	Launch Site Test Procedures	\$2,000,000	3/19/01
N64.	INR System Description and Analysis Document (Final)	\$1,000,000	4/27/01
N65.	Contingency Simulation # 1	\$4,000,000	8/2/02
N66.	Dress Rehearsal	\$3,000,000	9/13/02
N67.	GOES-N Data Book	\$10,000,000	10/08/00
N68.	GOES-N End-to-End Test 4 Completed	\$3,000,000	5/14/01
N69.	Algorithm Design Description - Build 3	\$4,000,000	1/20/99
N70.	1553 Data Bus Diagnostics Features Meeting	\$2,000,000	2/11/99
N71.	PES ADD Walk-Thru Review	\$2,000,000	7/15/99
N72.	PES Prototype GUI Demo	\$2,000,000	7/15/99
N73.	PES Delivery	\$500,000	10/15/99
N74.	Wideband Tape Recorder Delivery & Training	\$470,000	3/31/00
N75.	Safehold Mode Proposal	\$24,471	3/15/00
N76.	Electronic Data Distribution System & Configuration Management Review	\$2,000,000	5/10/00
N77.	Rebaseline Schedule Review	\$6,000,000	5/11/00
N78.	Integration and Test (I&T) Review	\$5,000,000	6/15/00
N79.	1 <sup>st</sup> Powered Testing of GOES N Bus Module	\$10,000,000	11/8/00



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SUPPLIES OR SERVICES AND PRICES/COSTS**

N80.	HSE Delivery to ITT for RTP Checkout	\$3,100,000	11/01/00
N81.	Red Team Kick-off Review	\$8,000,000	2/15/01
N82.	GOES N Solar Array Power Test	\$8,000,000	3/15/01
N83.	System Verification Review	\$7,000,000	3/15/01
N84.	GRODAS Implementation	\$5,000,000	4/15/01
N85.	Phase I SSGS Training	\$1,362,529	6/15/01
N86.	Solar Thermal Balance Test of Solar Array Yoke	\$3,000,000	6/15/01
N87.	EDDS Upgrade Acceptance	\$1,000,000	6/15/01
N88.	Completion of Spare Comm Boxes	\$1,021,539	9/14/01
N89.	Delivery of SSGS Mods	\$1,000,000	11/15/01
N90.	HSE Acceptance	\$1,000,000	1/15/02
N91.	Delivery of INR Analytical Tools	\$500,000	5/15/02

GOES O

Spacecraft System Level Reviews

O1.	Critical Design Review	\$2,000,000	2/11/00
O2.	Mission Operations Review	\$8,100,000	4/2/02
O3.	Pre-Environmental Review	\$6,700,000	4/18/02
O4.	Pre-Storage Review	\$12,000,000	12/11/02
O4A.	Pre-Shipment Review	\$500,000	12/11/03
O5.	Flight Operations Review	\$1,000,000	1/9/04
O6.	Spacecraft Launch Readiness Review	\$500,000	4/4/04

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**SUPPLIES OR SERVICES AND PRICES/COSTS**

**Software Subsystem Reviews**

O7.	Critical Design Review	\$4,500,000	9/27/99
O8.	Test Readiness Review	\$2,000,000	1/31/01
O9.	Acceptance Review	\$2,481,565	3/13/00

**Launch Services**

O10.	Launch Vehicle Interface Requirements Document	\$2,500,000	12/20/99
O11.	Spacecraft/Launch Vehicle Interface Control Document	\$2,100,000	1/27/00
O12.	Mission Integration Program Kickoff Review	\$2,500,000	8/11/99
O13.	Final Loads Verification Review	\$7,000,000	5/30/02
O14.	Launch Vehicle Requirements Review	\$5,000,000	12/16/99
O15.	Launch Vehicle Pre-Installation Review (Major Components)	\$2,000,000	8/19/03
O16.	Launch Vehicle Design Certification Review	\$500,000	2/5/04
O17.	Launch Vehicle Pre-Ship Review	\$2,500,000	10/10/03
O18.	Booster on Stand (BOS) Review	\$1,000,000	2/5/04
O19.	Pre-Payload Mate Review	\$500,000	3/18/04
O20.	Launch Vehicle Mission Peculiar Mission Unique Preliminary Design Review	\$2,000,000	1/11/00
O21.	Launch Vehicle Mission Peculiar Mission Unique Critical Design Review	\$500,000	3/15/03

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O22.	RESERVED		
O23.	RESERVED		
O24.	External Independent Readiness Review	\$1,000,000	2/12/04
O25.	Senior NASA Management Mission Readiness Review	\$500,000	3/10/04
O26.	Launch Readiness Review	\$500,000	3/31/04
System Events			
O27.	Spacecraft Engineering Handover	\$2,000,000	4/30/04
O28.	Final On-orbit Acceptance	\$1,000,000	9/24/04
Contractor Defined Milestones			
O29.	Gate 7 - Start Bus Integration	\$1,900,000	2/11/00
O30.	Gate 9 - Bus Complete	\$1,000,000	8/24/00
O31.	Gate 10 - Payload Complete	\$1,000,000	1/16/01
O32.	Bus & SEM Instruments Integration & Test Complete	\$13,000,000	1/16/01
O33.	XRS EUV EPS HEPAD Flight Unit #2 (N-O Spares) Pre-Shipment Review	\$1,500,000	12/07/01
O34.	Gate 12 - GOES O S C to System Test	\$4,000,000	4/03/02
O35.	Gate 13 - GOES O S C Complete	\$2,000,000	1/07/03
O36.	GOES-O End-to-End Test 4 Completed	\$2,000,000	12/05/02
O37.	Gate 7U.5 - GOES O Bus Propulsion Subsystem Complete	\$9,500,000	11/15/00
O38.	Gate 11 - GOES O Antenna to Integration	\$9,500,000	10/30/00
O39.	Gate 12A - Solar Wing to System Test	\$10,000,000	10/01/01

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SUPPLIES OR SERVICES AND PRICES/COSTS**

O40.	GOES O Bus Interface Verification Test	\$9,000,000	10/01/01
O41.	GOES O Yoke Electrical Testing	\$8,700,000	10/01/01
O42.	GOES O End-to-End Test 2 Completed	\$3,000,000	10/01/02

**GOES P**

**Spacecraft System Level Reviews**

P1.	Critical Design Review	\$3,750,000	2/6/04
P2.	Mission Operations Review	\$4,000,000	4/5/05
P3.	Pre-Environmental Review	\$4,000,000	7/5/05
P4.	Pre-Shipment Review	\$2,400,000	11/29/05
P5.	Flight Operations Review	\$2,400,000	1/12/06
P6.	Spacecraft Launch Readiness Review	\$2,300,000	4/4/06

**Software Subsystem Reviews**

P7.	Critical Design Review	\$7,000,000	11/4/03
P8.	Test Readiness Review	\$3,750,000	12/30/03
P9.	Acceptance Review	\$3,750,000	3/2/04

**Launch Services**

P10.	Launch Vehicle Interface Requirements Document	\$3,750,000	11/28/03
P11.	Spacecraft/Launch Vehicle Interface Control Document	\$4,000,000	1/5/05
P12.	Mission Integration Program Kickoff Review	\$7,000,000	10/8/03
P13.	Final Loads Verification Review	\$4,000,000	7/29/05

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MODIFICATION NO. 49  
SUPPLIES OR SERVICES AND PRICES/COSTS**

P14.	Launch Vehicle Requirements Review	\$7,500,000	11/3/04
P15.	Launch Vehicle Pre-Installation Review (Major Components)	\$4,000,000	8/25/05
P16.	Launch Vehicle Design Certification Review	\$5,000,000	10/5/05
P17.	Launch Vehicle Pre-Ship Review	\$5,000,000	10/19/05
P18.	Booster on Stand (BOS) Review	\$2,400,000	1/4/06
P19.	Pre-Payload Mate Review	\$2,400,000	3/17/06
P20.	Launch Vehicle Mission Peculiar/ Mission Unique Preliminary Design Review	\$3,750,000	4/7/04
P21.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$7,500,000	10/6/04
P22.	Launch Vehicle Component System Design Review (Major Mods only) (PDR Level)	\$3,750,000	6/30/04
P23.	Launch Vehicle Component System Design Review (Major Mods only) (CDR Level)	\$4,000,000	12/8/04
P24.	External Independent Readiness Review	\$2,400,000	2/10/06
P25.	Senior NASA Management Mission Readiness Review	\$2,400,000	3/8/06
P26.	Launch Readiness Review	\$2,300,000	3/29/06
System Events			
P27.	Spacecraft Engineering Handover	\$5,000,000	4/30/06

**SECTION B OF NAS5-98069**  
**MODIFICATION NO. 49**  
**SUPPLIES OR SERVICES AND PRICES/COSTS**

P28.	Final On-orbit Acceptance	\$8,900,000	9/28/06
<b>Contractor Defined Milestones</b>			
P29.	Kickoff Meeting	\$6,000,000	5/12/03
P30.	Deliver Launch Services Proposal	\$6,000,000	6/13/03
P31.	Manufacturing Readiness Review	\$6,000,000	7/17/03
P32.	Preliminary Design Review (If req'd)	\$6,000,000	8/14/03
P33.	Transfer SEM instruments from precontractual stores	\$6,000,000	9/15/03
P34.	Communication Subsystem to Integration	\$3,750,000	5/14/04
P35.	T&C Subsystem to Integration	\$3,750,000	6/14/04
P36.	Gate 11 - Antenna to Integration	\$3,750,000	6/25/04
P37.	ACS Subsystem to Integration	\$3,750,000	8/16/04
P38.	Gate 9 - Bus Complete	\$3,750,000	9/1/04
P39.	Bus & SEM Instruments Integration & Test Complete	\$3,750,000	9/17/04
P40.	S C Unit Integration Complete	\$4,000,000	2/15/05
P41.	SEM Instruments Integration & Test	\$4,000,000	3/14/05
P42.	Gate 12 - S/C to System Test	\$4,000,000	4/4/05
P43.	GFE Integration	\$4,000,000	5/16/05
P44.	Complete EMI/EMC Test	\$4,000,000	6/15/05

**SECTION B OF NAS5-98069  
MODIFICATION NO. 49  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**GOES Q**

**Spacecraft System Level Reviews**

Q1.	Critical Design Review	\$3,600,000	2/7/06
Q2.	Mission Operations Review	\$3,900,000	4/3/07
Q3.	Pre-Environmental Review	\$3,900,000	7/3/07
Q4.	Pre-Shipment Review	\$2,300,000	11/27/07
Q5.	Flight Operations Review	\$2,300,000	1/15/08
Q6.	Spacecraft Launch Readiness Review	\$2,200,000	4/4/08

**Software Subsystem Reviews**

Q7.	Critical Design Review	\$7,000,000	11/3/05
Q8.	Test Readiness Review	\$3,600,000	12/29/05
Q9.	Acceptance Review	\$3,600,000	3/2/06

**Launch Services**

Q10.	Launch Vehicle Interface Requirements Document	\$3,600,000	11/29/05
Q11.	Spacecraft Launch Vehicle Interface Control Document	\$3,900,000	1/8/07
Q12.	Mission Integration Program Kickoff Review	\$7,000,000	10/10/05
Q13.	Final Loads Verification Review	\$3,900,000	7/27/07
Q14.	Launch Vehicle Requirements Review	\$7,000,000	11/6/06

**SECTION B OF NAS5-98069  
MODIFICATION NO. 49  
SUPPLIES OR SERVICES AND PRICES/COSTS**

Q15.	Launch Vehicle Pre-Installation Review (Major Components)	\$3,900,000	8/27/07
Q16.	Launch Vehicle Design Certification Review	\$4,900,000	10/8/07
Q17.	Launch Vehicle Pre-Ship Review	\$4,900,000	10/22/07
Q18.	Booster on Stand (BOS) Review	\$2,300,000	1/7/08
Q19.	Pre-Payload Mate Review	\$2,300,000	3/19/08
Q20.	Launch Vehicle Mission Peculiar Mission Unique Preliminary Design Review	\$3,600,000	4/10/06
Q21.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$7,000,000	10/9/06
Q22.	Launch Vehicle Component System Design Review (Major Mods only) (PDR Level)	\$3,600,000	7/3/06
Q23.	Launch Vehicle Component System Design Review (Major Mods only) (CDR Level)	\$4,000,000	12/11/06
Q24.	External Independent Readiness Review	\$2,300,000	2/13/08
Q25.	Senior NASA Management Mission Readiness Review	\$2,300,000	3/10/08
Q26.	Launch Readiness Review	\$2,300,000	3/31/08
System Events			
Q27.	Spacecraft Engineering Handover	\$4,900,000	4/30/08
Q28.	Final On-orbit Acceptance	\$9,000,000	9/26/08



**SECTION B OF NAS5-98069**  
**MODIFICATION NO. 49**  
**SUPPLIES OR SERVICES AND PRICES/COSTS**

**Contractor Defined Milestones**

Q29.	Kickoff Meeting	\$5,800,000	5/11/05
Q30.	Deliver Launch Services Proposal	\$5,800,000	6/14/05
Q31.	Manufacturing Readiness Review	\$5,800,000	7/18/05
Q32.	Preliminary Design Review (If req'd)	\$5,800,000	8/15/05
Q33.	Transfer SEM instruments from precontractual stores	\$5,800,000	9/14/05
Q34.	Communication Subsystem to Integration	\$3,600,000	5/15/06
Q35.	T&C Subsystem to Integration	\$3,600,000	6/14/06
Q36.	Gate 11 - Antenna to Integration	\$3,600,000	6/27/06
Q37.	ACS Subsystem to Integration	\$3,600,000	8/16/06
Q38.	Gate 9 - Bus Complete	\$3,500,000	9/1/06
Q39.	Bus & SEM Instruments Integration & Test Complete	\$3,500,000	9/19/06
Q40.	S C Unit Integration Complete	\$3,900,000	2/13/07
Q41.	SEM Instruments Integration & Test	\$3,900,000	3/12/07
Q42.	Gate 12 - S C to System Test	\$3,900,000	4/2/07
Q43.	GFE Integration	\$3,900,000	5/14/07
Q44.	Complete EMI EMC Test	\$3,900,000	6/13/07

If a review for GOES O, P or Q is not required, in accordance with paragraph 1.1 of the Statement of Work, the contractor shall submit the invoice for that associated event at the specified time in this clause.

(End of Clause)

**SECTION F OF NAS5-98069  
MODIFICATION NO. 49  
DELIVERIES OR PERFORMANCE**

**F.1 DELIVERY SCHEDULE (GSFC 52.212-93) (OCT 1988)**

The items required by this contract shall be delivered as follows:

<u>Contract Line Item Number (CLIN)</u>	<u>Description</u>	<u>Delivery Date</u>	<u>SOW Reference</u>
1.	On-Orbit Acceptance of GOES N Spacecraft	End of GOES N PLT	3.6.4
2.	Propulsion Computer Model & Supporting Documentation	GOES N ESD-3 mos.	3.2.3.1
3.	a. Software Development & Validation Environment	April 2002	3.2.12.5
	b. GTACS Workstation for SXI T&C, I&V, and Software Development	February 1999	
4.	Source & Executable Flight Software Code	GOES N ESD-3 mos.	
5.	Emulators S/C Emulators (2)	GOES N ESD -16 mos.	3.1.13 & 3.3.13 Spec 11.3
6.	INR Performance Evaluation System	Spacecraft CDR - 3 mos.	3.2.16.1 3.3.16 Spec. 11.4
7.	SXI to Spacecraft Harness	March 2000	3.3.11.4
8.	Battery Test Cells (5 from each activation lot)	1 mo. after S/C Contractor Acceptance of Flight Cells	3.3.6.1

**SECTION F OF NAS5-98069  
MODIFICATION NO. 49  
DELIVERIES OR PERFORMANCE**

- |     |   |                |
|-----|---|----------------|
| 21. | Additional Integration &<br>Testing Support | See Clause H.4 |
| 22. | Spacecraft Storage                          | See Clause H.4 |

Solely for purposes of mailing DD Form 250, the shipment address shall be to the Contracting Officer, Mail Code 214.2, NASA/GSFC, Greenbelt, MD 20771.

(End of clause)

**F.2 ENGINEERING HANDOVER DATES AND STORAGE DATES**

The following dates are defined as the engineering handover dates and the earliest dates at which the spacecraft may be placed into ground storage as defined in Clause H.4:

	<u>Earliest Ground Storage Date</u>	<u>Engineering Handover Date</u>
GOES N	January 1, 2002	January 31, 2003
GOES O	January 1, 2003	April 30, 2004
GOES P	January 1, 2006	April 30, 2006
GOES Q	January 1, 2008	April 30, 2008

The contractor shall place the GOES N and O spacecraft into storage at the contractor's facility immediately following successful completion of spacecraft Integration and Test (I&T), but no earlier than the dates specified for Earliest Storage Date (ESD). No storage charges, as defined in Clause H.4, shall be paid prior to the ESD.

(End of clause)

**F.3 SECTION F CLAUSES INCORPORATED BY REFERENCE**

- (52.242-15) STOP-WORK ORDER (AUG 1989)  
(52.247-34) F.O.B. DESTINATION (NOV 1991)

(End of By Reference Section)

**SECTION H OF NAS5-98069  
MODIFICATION NO. 49  
SPECIAL CONTRACT REQUIREMENTS**

**H.3 PRE-DETERMINED ADJUSTMENT FOR LATE DELIVERY**

(a) If the engineering handover date, as defined in the contract schedule, is delayed by more than one hundred twenty (120) days for GOES N, more than ninety (90) days for GOES O or more than thirty (30) days for either GOES P or GOES Q by the contractor, the contractor shall pay to the Government, for each calendar day of delay, beginning with the one hundred twenty-first day for GOES N, ninety-first day for GOES O or thirty-first day for any subsequent spacecraft, from the originally specified engineering handover date until the actual engineering handover date of said spacecraft, the sum of \$50,000, up to a maximum of \$ \* , for each spacecraft. The form of payment, whether a contract credit or otherwise, will be determined by the Contracting Officer. The prices in this paragraph may be impacted by Clause H.16.

\* GOES-N = \$5,000,000 and GOES-O, P & Q = \$2,000,000 each

(b) Alternatively, if delivery or performance is so delayed, the Government may terminate this contract in whole or in part under the Default-Supply and Service clause in this contract and in that event, the Contractor shall be liable for \$50,000 per day, which shall not exceed the maximum of \$12,000,000, accruing until the time the Government may reasonably obtain delivery or performance of similar supplies or services. This clause shall not diminish any rights to which the Government is entitled under the Default clause or any other clause of this contract.

(c) The Contractor shall not be charged with late delivery fees or liquidated damages when the delay in delivery or performance arises out of causes beyond the control and without the fault or negligence of the Contractor as defined in the Default--(Fixed Price Supply and Service) (FAR 52.249-8) clause in this contract. Delay in delivery or performance due solely to the lack of availability of the Deep Space Network shall be considered to be beyond the control and without the fault or negligence of the contractor for the purposes of this clause.

(End of Clause)

**SECTION H OF NAS5-98069  
MODIFICATION NO. 49  
SPECIAL CONTRACT REQUIREMENTS**

**4.2.3 Stationkeeping Mode**

Table 4.2.3-1 and 4.2.3-2 were deleted.

INR performance shall be within specification immediately after the 10 minute housekeeping period. EW stationkeeping shall be performed within the 10 minute housekeeping period.

**4.2.4 Housekeeping Mode**

EW stationkeeping shall be performed within the 10 minute housekeeping period.

**Imager and Sounder ICD 3.2.3.2 Radiant Cooler FOV**

The total thermal and reflected solar power that intercepts the Imager and Sounder radiant cooler north faces at incident angles from 0 to 25 degrees shall not exceed  $1.13 \times 10^{-4}$  W/sq. cm. The total thermal and reflected solar power that intercepts the Imager and Sounder radiant cooler north faces at incident angles from 25 to 90 degrees shall be zero.

**9.1.1.1 General**

The Contractor shall provide the capability of receiving simultaneous data from both Magnetometers along with the algorithms to process the data to remove static and variable spacecraft generated fields in real time.

(End of clause)

**H.22 ADVANCE AGREEMENT FOR CHANGES TO ADDITIONAL SPACECRAFT**

When NASA exercises its options under clause H.1, OPTION FOR ADDITIONAL SPACECRAFT, the technical changes arising from Configuration Change Request (CCR) 4226C will have been incorporated into the specification; no additional change order will be necessary to apply the requirements of CCR 4226C to the additional spacecraft. However, as a result of the changes made to the specification, the prices of each optional spacecraft will increase by the following amounts:

Option 1, GOES P	\$547,938
Option 2, GOES Q	\$580,330

These adjustments will constitute full and equitable adjustment for all changes made under CCR 4226C and Modification 49. The contractor agrees that when each option is exercised, the contractor will release the Government from further claims arising from CCR 4226C for the additional spacecraft.

All other terms and conditions of the contract remain in effect for these options.

(End of clause)

**SECTION H OF NAS5-98069  
MODIFICATION NO. 49  
SPECIAL CONTRACT REQUIREMENTS**

**H.23 ADVANCE AGREEMENT FOR LAUNCH SERVICES ESCALATION COSTS**

The fixed price of this contract may receive a one-time adjustment for escalation costs associated with equitable adjustment of the engineering handover date for GOES N. The Contractor shall submit a proposal for the escalation costs only associated with adjusting the engineering handover date from October 31, 2002 to January 31, 2003. The price of GOES N may be increased by the amount of the equitable adjustment to be definitized after receipt of the proposal but not to exceed \$999,000. The Contractor shall assert the right to submit this proposal no later than July 31, 2001.

(End of clause)



**INDIVIDUAL SUBCONTRACTING PLAN**

**DATE:** 12/13/00 **PLAN #** SC97-04-D

**CONTRACT/RFP #:** NAS5-98069 (Contract Modification #49)

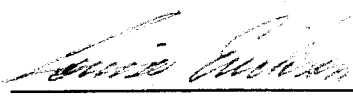
**HE REFERENCE #:** L0226

**MODIFICATION #** Revision #1

MASTER SUBCONTRACTING PLAN #HECMSP 99-00, REVISION #1  
APPROVED FOR USE DURING FISCAL YEARS 1999-2000  
FOR THE UTILIZATION OF THE FOLLOWING BUSINESS CONCERNS:

- Small Business (SB)
- Small Disadvantaged Business (SDB)
- Historically Black Colleges and Universities and Minority Institutions
- Small Woman Owned Business (SWOB)
- Veteran Business
- Service-Disabled Veteran Business
- HUBZone Business

**Approval:**

  
\_\_\_\_\_  
**Small Business Programs Manager**

## **INDIVIDUAL SUBCONTRACTING PLAN**

**Submitted By:**

**Group**

**Address**

**City, State**

Boeing Satellite Systems

P.O. Box 92919

Los Angeles, California 90009

**Plan Administrator:**

**Title**

**Location**

**Telephone**

Patricia A. Williams

Subcontract Manager

SC/S50/X334

(310) 662-6270

**Small Business Programs Manager:**

**Name**

**Location**

**Telephone**

Louise Erickson

SC/S41/A350

(310) 364-6067

**Contract Administrator:**

**Title**

**Location**

**Telephone**

James T. Felicita

Manager, NASA Contracts

SC/S41/A370

(310) 416-4244

**Principal Contracting Officer:**

**Agency**

**Address**

**Telephone**

Sandra Marshall

NASA Goddard Space Flight Center

Greenbelt, MD 20771

(301) 286-4472

**Administrative Contracting Officer:**

**Agency**

**Address**

**Telephone**

Ms. Linda Cox - DCMA Carson

Defense Contract Management Agency

18901 South Wilmington Avenue, Carson, CA  
90745-3856

(310) 900-6676



### 1. CONTRACT INFORMATION

Contract/RFP No. NAS5-98069 (Contract Modification #49)

Description Risk Reduction Proposal

Period of Performance 1 January 2001 to 31 April 2004

Effective Date of Contract 1 January 2001 (estimated)

Change No. \_\_\_\_\_ Date: \_\_\_\_\_

### 2. VALUES

Total Current Contract Value	\$ <u>38,365,633</u>	<u>100%</u>
Planned Subcontract Dollars	\$ <u>7,467,436</u>	<u>19.5</u>
Domestic Subcontract Dollars	\$ <u>7,467,436</u>	<u>19.5</u>

### 3. GOALS

For the purpose of this individual subcontracting plan, the following separate percentage goals are hereby expressed in terms of a percentage of the total planned domestic subcontract dollars. These planned subcontract dollars include all first tier subcontracts to be awarded in the performance of this contract.

HE hereby commits to perform to their best efforts to meet or exceed the following goals:

PLANNED SUBCONTRACT BASE:	<u>AMOUNT</u>	<u>PERCENT</u>
1. Total Dollars	\$ <u>7,467,436</u>	<u>100</u> %
2. To Large Business	\$ <u>6,873,636</u>	<u>92</u> %
3. To Small Business	\$ <u>593,800</u>	<u>8</u> %

SMALL BUSINESS CONCERNS:	<u>AMOUNT</u>	<u>PERCENT OF ITEM 1 TOTAL</u>
4. Small Disadvantaged Business	\$ <u>3,922</u>	<u>~1%</u> %
5. HBCUs/Mis	\$ <u>0</u>	<u>0</u> %
6. Small Woman Owned Business	\$ <u>43,302</u>	<u>.6</u> %
7. Veteran Business	\$ <u>N/A</u>	<u>N/A</u> %
8. Service-Disabled Veteran Business	\$ <u>N/A</u>	<u>N/A</u> %
9. HUBZone Business	\$ <u>N/A</u>	<u>N/A</u> %

COMMENTS RELATIVE TO STATED GOALS:

Items 4 and 5 are less than 5% of the total dollars because procurement of spacecraft ground system support represent the majority of the total amount to be subcontracted. Of the remaining subcontracting amount, the public law percentages have been applied to small woman owned and small disadvantaged businesses.

We will continue to work with Prono Enterprises, a small woman owned business who provides enhancements to our EDDS/configuration management system.

Items 7 through 9 are not part of the original Subcontract Plan. All of the planned subcontracting dollars represent change of scope to existing GOES subcontracts.

4. MODIFICATIONS

Upon receipt of a modification to this contract exceeding the \$500,000 threshold, (\$1,000,000 for construction), Hughes will promptly negotiate applicable revisions to the appropriate subcontract goal reflecting those changes.

5. TECHNICAL ASSISTANCE TO SMALL BUSINESS CONCERNS

In addition to those actions described in the Master Subcontracting Plan, the following specific efforts will be undertaken to ensure these concerns receive an opportunity to participate in the performance of this contract as subcontractors and to aid in the achievement of the above stated goals:

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6. PRINCIPAL PRODUCTS AND SERVICE AREAS

Appendix A attached hereto contains a description of the principal supply and service areas scheduled to be subcontracted and identification of those areas anticipated to be subcontracted to small business concerns.

7. PLAN ADMINISTRATOR

Responsibility for the implementation and administration of this subcontracting plan is vested in the responsible Plan Administrator whose name appears on the cover sheet. Hughes reserves the right to substitute another qualified individual as Plan Administrator should the need arise. The duties of the Plan Administrator shall include but not be limited to the following:

- a) Prepare small business subcontracting plans that include percentage goals, a description of efforts facilitating small business participation, and assurances that subcontracts contain flow-down provisions.
  - b) Assure Materiel contract briefs disclose terms and conditions of the company concerning small business plans including provisions for incentive award fees and reporting requirements and make certain that such briefs are distributed to all performing organizations.
  - c) Ensure that small business capabilities are adequately considered and that such firms are listed as potential sources on the make-or-buy plan.
- 
- d) Bring to management's attention any matter that could impair accomplishment of goals specified in subcontracting plans that might adversely affect the company.

## APPENDIX A

### PRINCIPAL PRODUCTS AND SERVICE AREAS BY BUSINESS SIZE CATEGORIES

HE anticipates procurement of the following listed products and services from the following categories of business concerns:

PRODUCTS/SERVICES		ALL SMALL BUSINESS CONCERNS				
	LARGE	SB	SDB	OTHER*	SWOB	HUBZONE
1. Spacecraft support for ground systems	X					
2. Software/services	X	X				
3. Enhancements to EDDS/Configuration Management System					X	
4. Miscellaneous material and services	X	X	X		X	
5. Cryogenic Equipment	X					
6.						
7.						
8.						
9.						
10.						

Legend:

SB = Small Business

SDB = Small Disadvantaged Business

Other\* =

- a) HBCU/MI = Historically Black Colleges and Universities, and Minority Institutions
- b) Veteran Business
- c) Service-Disabled Veteran Business

SWOB = Small Women Owned Business

HUBZone = Historically Underutilized Business Zone

**Exhibit 2**

**SMALL BUSINESS PROGRAMS ADMINISTRATORS**

**Boeing Satellite Systems**

**Louise Erickson**  
**Small Business Programs Manager**  
Bldg. S41, MS A350  
P.O. Box 92919  
Los Angeles, CA 90009

Tele: (310)364-6067  
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**ELECTRON DYNAMICS DIVISION**

**Steve Ellis**  
**Small Business Programs Administrator**  
Bldg. 232, MS 1450  
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Torrance, CA 90509-2999

Tele: (310) 517-5884  
Fax: (310)517-5736  
e-mail: steve.ellis@hsc.com

**SPECTROLAB, INC.**

**Nancy Mason**  
**Small Business Programs Administrator**  
Bldg. SL/727/SYLMAR  
12500 Gladstone Avenue  
Sylmar, CA 91342-5373

Tele: (818) 898-2855  
Fax: (818) 898-7500  
e-mail: n.mason@spectrolab.com



**INDIVIDUAL SUBCONTRACTING PLAN**

DATE: 12/13/00 PLAN # SC97-04-D

CONTRACT/RFP #: NAS5-98069 Contract Modification No. 49, Option P

HE REFERENCE #: L0226

MODIFICATION # Revision #1

MASTER SUBCONTRACTING PLAN #HECMSP 99-00, REVISION #1  
APPROVED FOR USE DURING FISCAL YEARS 1999-2000  
FOR THE UTILIZATION OF THE FOLLOWING BUSINESS CONCERNS:

- Small Business (SB)
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- Historically Black Colleges and Universities and Minority Institutions
- Small Woman Owned Business (SWOB)
- Veteran Business
- Service-Disabled Veteran Business
- HUBZone Business

Approval:

Small Business Programs Manager

## INDIVIDUAL SUBCONTRACTING PLAN

**Submitted By:**

Group  
Address  
City, State

Boeing Satellite Systems  
P.O. Box 92919  
Los Angeles, California 90009

**Plan Administrator:**

Title  
Location  
Telephone

Patricia A. Williams  
Subcontract Manager  
SC/S50/X334  
(310) 662-6270

**Small Business Programs Manager:**

Name  
Location  
Telephone

Louise Erickson  
SC/S41/A350  
(310) 364-6067

**Contract Administrator:**

Title  
Location  
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James T. Felicita  
Manager, NASA Contracts  
SC/S41/A370  
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**Principal Contracting Officer:**

Agency  
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Sandra Marshall  
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Ms. Linda Cox - DCMA Carson  
Defense Contract Management Agency  
18901 South Wilmington Avenue, Carson, CA  
90745-3856  
(310) 900-6676

## 1. CONTRACT INFORMATION

Contract/RFP No. NAS5-98069 (Contract Modification #49)

Description Risk Reduction Proposal

Period of Performance 04/30/03 through 09/28/06

Effective Date of Contract 1 January 2001 (estimated)

Change No. \_\_\_\_\_ Date: \_\_\_\_\_

## 2. VALUES

Total Current Contract Value	\$ <u>547,938</u>	<u>100%</u>
Planned Subcontract Dollars	\$ <u>40,000</u>	<u>7.3</u>
Domestic Subcontract Dollars	\$ <u>40,000</u>	<u>7.3</u>

## 3. GOALS

For the purpose of this individual subcontracting plan, the following separate percentage goals are hereby expressed in terms of a percentage of the total planned domestic subcontract dollars. These planned subcontract dollars include all first tier subcontracts to be awarded in the performance of this contract.

HE hereby commits to perform to their best efforts to meet or exceed the following goals:

PLANNED SUBCONTRACT BASE:	<u>AMOUNT</u>	<u>PERCENT</u>
1. Total Dollars	\$ <u>40,000</u>	<u>100</u> %
2. To Large Business	\$ <u>24,000</u>	<u>60</u> %
3. To Small Business	<u>16,000</u>	<u>40</u> %

SMALL BUSINESS CONCERNS:	<u>AMOUNT</u>	<u>PERCENT OF ITEM 1 TOTAL</u>
4. Small Disadvantaged Business	\$ <u>2,240</u>	<u>5.6</u> %
5. HBCUs/Mis	\$ <u>0</u>	<u>0</u> %
6. Small Woman Owned Business	\$ <u>2,000</u>	<u>5.0</u> %
7. Veteran Business	\$ <u>N/A</u>	<u>N/A</u> %
8. Service-Disabled Veteran Business	\$ <u>N/A</u>	<u>N/A</u> %
9. HUBZone Business	\$ <u>N/A</u>	<u>N/A</u> %



COMMENTS RELATIVE TO STATED GOALS:

This option is comprised of miscellaneous materials and services. We are proposing public law percentages to small businesses and Boeing Satellite Systems will make every effort to exceed these goals.

4. MODIFICATIONS

Upon receipt of a modification to this contract exceeding the \$500,000 threshold, (\$1,000,000 for construction), Hughes will promptly negotiate applicable revisions to the appropriate subcontract goal reflecting those changes.

5. TECHNICAL ASSISTANCE TO SMALL BUSINESS CONCERNS

In addition to those actions described in the Master Subcontracting Plan, the following specific efforts will be undertaken to ensure these concerns receive an opportunity to participate in the performance of this contract as subcontractors and to aid in the achievement of the above stated goals:

6. PRINCIPAL PRODUCTS AND SERVICE AREAS

Appendix A attached hereto contains a description of the principal supply and service areas scheduled to be subcontracted and identification of those areas anticipated to be subcontracted to small business concerns.

7. PLAN ADMINISTRATOR

Responsibility for the implementation and administration of this subcontracting plan is vested in the responsible Plan Administrator whose name appears on the cover sheet. Hughes reserves the right to substitute another qualified individual as Plan Administrator should the need arise. The duties of the Plan Administrator shall include but not be limited to the following:

- a) Prepare small business subcontracting plans that include percentage goals, a description of efforts facilitating small business participation, and assurances that subcontracts contain flow-down provisions.
  - b) Assure Materiel contract briefs disclose terms and conditions of the company concerning small business plans including provisions for incentive award fees and reporting requirements and make certain that such briefs are distributed to all performing organizations.
  - c) Ensure that small business capabilities are adequately considered and that such firms are listed as potential sources on the make-or-buy plan.
- 
- d) Bring to management's attention any matter that could impair accomplishment of goals specified in subcontracting plans that might adversely affect the company.

## APPENDIX A

### PRINCIPAL PRODUCTS AND SERVICE AREAS BY BUSINESS SIZE CATEGORIES

HE anticipates procurement of the following listed products and services from the following categories of business concerns:

PRODUCTS/SERVICES		ALL SMALL BUSINESS CONCERNS				
	LARGE	SB	SDB	OTHER*	SWOB	HUBZONE
1. Miscellaneous material and services	X	X	X		X	
2.						
3						
4						
5.						
6.						
7.						
8.						
ces						
9.						
10.						

Legend:

SB = Small Business

SDB = Small Disadvantaged Business

Other\* =

- a) HBCU/MI = Historically Black Colleges and Universities, and Minority Institutions
- b) Veteran Business
- c) Service-Disabled Veteran Business

SWOB = Small Women Owned Business

HUBZone = Historically Underutilized Business Zone

**Exhibit 2**

**SMALL BUSINESS PROGRAMS ADMINISTRATORS**

**Boeing Satellite Systems**

**Louise Erickson**  
**Small Business Programs Manager**

Bldg. S41, MS A350  
P.O. Box 92919  
Los Angeles, CA 90009

Tele: (310)364-6067  
Fax: (310)662-6165  
e-mail: louise.erickson@hsc.com

**ELECTRON DYNAMICS DIVISION**

**Steve Ellis**  
**Small Business Programs Administrator**

Bldg. 232, MS 1450  
P.O. Box 2999  
Torrance, CA 90509-2999

Tele: (310) 517-5884  
Fax: (310)517-5736  
e-mail: steve.ellis@hsc.com

**SPECTROLAB, INC.**

**Nancy Mason**  
**Small Business Programs Administrator**

Bldg. SL/727/SYLMAR  
12500 Gladstone Avenue  
Sylmar, CA 91342-5373

Tele: (818) 898-2855  
Fax: (818) 898-7500  
e-mail: n.mason@spectrolab.com



**INDIVIDUAL SUBCONTRACTING PLAN**

**DATE:** 12/13/00 **PLAN #** SC97-04-D

**CONTRACT/RFP #:** NAS5-98069 (Contract Modification No. 49, Option Q)

**HE REFERENCE #:** L0226

**MODIFICATION #** Revision #1

MASTER SUBCONTRACTING PLAN #HECMSP 99-00, REVISION #1  
APPROVED FOR USE DURING FISCAL YEARS 1999-2000  
FOR THE UTILIZATION OF THE FOLLOWING BUSINESS CONCERNS:

- Small Business (SB)
- Small Disadvantaged Business (SDB)
- Historically Black Colleges and Universities and Minority Institutions
- Small Woman Owned Business (SWOB)
- Veteran Business
- Service-Disabled Veteran Business
- HUBZone Business

**Approval:**

**Small Business Programs Manager**

## INDIVIDUAL SUBCONTRACTING PLAN

**Submitted By:**

Group  
Address  
City, State

Boeing Satellite Systems  
P.O. Box 92919  
Los Angeles, California 90009

**Plan Administrator:**

Title  
Location  
Telephone

Patricia A. Williams  
Subcontract Manager  
SC/S50/X334  
(310) 662-6270

**Small Business Programs Manager:**

Name  
Location  
Telephone

Louise Erickson  
SC/S41/A350  
(310) 364-6067

**Contract Administrator:**

Title  
Location  
Telephone

James T. Felicita  
Manager, NASA Contracts  
SC/S41/A370  
(310) 416-4244

**Principal Contracting Officer:**

Agency  
Address  
Telephone

Sandra Marshall  
NASA Goddard Space Flight Center  
Greenbelt, MD 20771  
(301) 286-4472

**Administrative Contracting Officer:**

Agency  
Address  
Telephone

Ms. Linda Cox - DCMA Carson  
Defense Contract Management Agency  
18901 South Wilmington Avenue, Carson, CA  
90745-3856  
(310) 900-6676

### 1. CONTRACT INFORMATION

Contract/RFP No. NAS5-98069 (Contract Modification #49)

Description Risk Reduction Proposal

Period of Performance 04/30/05 through 09/28/08

Effective Date of Contract 1 January 2001 (estimated)

Change No. \_\_\_\_\_ Date: \_\_\_\_\_

### 2. VALUES

Total Current Contract Value	\$ <u>580,330</u>	<u>100%</u>
Planned Subcontract Dollars	\$ <u>40,000</u>	<u>6.9</u>
Domestic Subcontract Dollars	\$ <u>40,000</u>	<u>6.9</u>

### 3. GOALS

For the purpose of this individual subcontracting plan, the following separate percentage goals are hereby expressed in terms of a percentage of the total planned domestic subcontract dollars. These planned subcontract dollars include all first tier subcontracts to be awarded in the performance of this contract.

HE hereby commits to perform to their best efforts to meet or exceed the following goals:

PLANNED SUBCONTRACT BASE:	<u>AMOUNT</u>	<u>PERCENT</u>
1. Total Dollars	\$ <u>40,000</u>	<u>100</u> %
2. To Large Business	\$ <u>24,000</u>	<u>60</u> %
3. To Small Business	<u>16,000</u>	<u>40</u> %

SMALL BUSINESS CONCERNS:	<u>AMOUNT</u>	<u>PERCENT OF ITEM 1 TOTAL</u>
4. Small Disadvantaged Business	\$ <u>2,240</u>	<u>5.6</u> %
5. HBCUs/Mis	\$ <u>0</u>	<u>0</u> %
6. Small Woman Owned Business	\$ <u>2,000</u>	<u>5</u> %
7. Veteran Business	\$ <u>N/A</u>	<u>N/A</u> %
8. Service-Disabled Veteran Business	\$ <u>N/A</u>	<u>N/A</u> %
9. HUBZone Business	\$ <u>N/A</u>	<u>N/A</u> %

COMMENTS RELATIVE TO STATED GOALS:

This option is comprised of miscellaneous materials and services. We are proposing public law percentages to small businesses and Boeing Satellite Systems will make every effort to exceed these goals.

4. MODIFICATIONS

Upon receipt of a modification to this contract exceeding the \$500,000 threshold, (\$1,000,000 for construction), Hughes will promptly negotiate applicable revisions to the appropriate subcontract goal reflecting those changes.

5. TECHNICAL ASSISTANCE TO SMALL BUSINESS CONCERNS

In addition to those actions described in the Master Subcontracting Plan, the following specific efforts will be undertaken to ensure these concerns receive an opportunity to participate in the performance of this contract as subcontractors and to aid in the achievement of the above stated goals:

6. PRINCIPAL PRODUCTS AND SERVICE AREAS

Appendix A attached hereto contains a description of the principal supply and service areas scheduled to be subcontracted and identification of those areas anticipated to be subcontracted to small business concerns.

7. PLAN ADMINISTRATOR

Responsibility for the implementation and administration of this subcontracting plan is vested in the responsible Plan Administrator whose name appears on the cover sheet. Hughes reserves the right to substitute another qualified individual as Plan Administrator should the need arise. The duties of the Plan Administrator shall include but not be limited to the following:



- a) Prepare small business subcontracting plans that include percentage goals, a description of efforts facilitating small business participation, and assurances that subcontracts contain flow-down provisions.
- b) Assure Materiel contract briefs disclose terms and conditions of the company concerning small business plans including provisions for incentive award fees and reporting requirements and make certain that such briefs are distributed to all performing organizations.
- c) Ensure that small business capabilities are adequately considered and that such firms are listed as potential sources on the make-or-buy plan.
- d) Bring to management's attention any matter that could impair accomplishment of goals specified in subcontracting plans that might adversely affect the company.

## APPENDIX A

### PRINCIPAL PRODUCTS AND SERVICE AREAS BY BUSINESS SIZE CATEGORIES

HE anticipates procurement of the following listed products and services from the following categories of business concerns:

PRODUCTS/SERVICES		ALL SMALL BUSINESS CONCERNS				
	LARGE	SB	SDB	OTHER*	SWOB	HUBZONE
1. Miscellaneous material and services	X	X	X		X	
2.						
3						
4						
5.						
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8.						
ces						
9.						
10.						

Legend:

SB = Small Business

SDB = Small Disadvantaged Business

Other\* =

- a) HBCU/MI = Historically Black Colleges and Universities, and Minority Institutions
- b) Veteran Business
- c) Service-Disabled Veteran Business

SWOB = Small Women Owned Business

HUBZone = Historically Underutilized Business Zone

**Exhibit 2**

**SMALL BUSINESS PROGRAMS ADMINISTRATORS**

**Boeing Satellite Systems**

**Louise Erickson**  
**Small Business Programs Manager**  
Bldg. S41, MS A350  
P.O. Box 92919  
Los Angeles, CA 90009

Tele: (310)364-6067  
Fax: (310)662-6165  
e-mail: louise.erickson@hsc.com

**ELECTRON DYNAMICS DIVISION**

**Steve Ellis**  
**Small Business Programs Administrator**  
Bldg. 232, MS 1450  
P.O. Box 2999  
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e-mail: steve.ellis@hsc.com

**SPECTROLAB, INC.**

**Nancy Mason**  
**Small Business Programs Administrator**  
Bldg. SL/727/SYLMAR  
12500 Gladstone Avenue  
Sylmar, CA 91342-5373

Tele: (818) 898-2855  
Fax: (818) 898-7500  
e-mail: n.mason@spectrolab.com

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 2

2. AMENDMENT/MODIFICATION NO.

ifty (50)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NASS-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 See Page 2

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X

d. OTHER (Specify type of modification and authority)  
Unilateral Modification; Clause H.6 LIMITATION OF FUNDS

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$32,000,000 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)

BY Sandra Marshall  
(Signature of Contracting Officer)

1/22/01

1. In Clause H.6, increase the funding from \$255,628,313 by \$32,000,000 to \$287,628,313. The period of allotment is from the effective date of the contract through October 26, 2001 in accordance with the contractor's correspondence dated January 17, 2001.

---

2. ~~Block 12 Accounting and Appropriation Data:~~

PCN: 415-02671A(1C)  
JON: 415-616-41-81-11  
APP: 801/20110(01)  
BLI: A702  
OC: 41-2550  
AMT: \$32,000,000

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 50  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$287,628,313 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:

**SECTION H OF NAS5-98069  
MODIFICATION NO. 50  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until October 26, 2001.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 4

2. AMENDMENT/MODIFICATION NO.

Fifty-One (51)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE	FACILITY CODE
(X) 9A. AMENDMENT OF SOLICITATION NO.	9B. DATED (SEE ITEM 11)
X 10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

: BX B'NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)	A THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A
	B THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF Clause 52.243-1 Changes Fixed Price—Alt. II
	d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14 description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4236, 4238, 6073, 6075, 6116, 6117, 6119B, 6124, 6125A, 6129, 6131, 6132, 6133, 6134, 6136, 7032, 7034A, 7035 and 7037B at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

*J.T. Felicita*  
(Signature of person authorized to sign)

5/22/01

BY *Sandra Marshall*  
(Signature of Contracting Officer)

5/24/01

FORM 7540-01-152-8070

30-105

STANDARD FORM 30 (Rev. 10-83)

PREVIOUS EDITION UNUSABLE

Prescribed by GSA



**1. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment B, Performance Specification

In section 9.4.2.1, delete the allowance for a 10% growth margin as reflected in CCR 6073.

In section 10.1.3.1.4, relax the requirement for end-to-end accuracy of specified analog signals as reflected in CCR 6075.

In section 5.0 clarify the solar array radiation fluence requirements as reflected in CCR 6134.

In section 2.0 add Imager/Sounder EGSE ICD to the list of Applicable Documents as reflected in CCR 6136.

Attachment B, Performance Specification, Appendix A, Deviation and Waiver Requests

In 8.5 and 8.6.9 note the deviation from the qualification and acceptance testing of the Optical Port Cover Mechanism requirements change as reflected in CCR 6132.

Attachment C, GOES N-Q Imager Interface Control Document

Correct table 3.4.1-2, table 3.5.1-6, figure 3.5.2-2 and table 3.5.4-4 as reflected in CCR 6124.

Document the safehold requirements in 3.8.1 and table 3.4.2-4 as reflected in CCR 6131.

Document the part numbers in 3.1.5 and table 3.1.5-1 as reflected in CCR 6133.

In table 3.5.2-7 and section 3.5.3.4, add accuracy, latency, stability information for the IMC and Servo Error telemetry signals in the wideband and MDL data as reflected in CCR 7032.

In table 3.4.3-5 change the field strength for DCPI repeater 468.8 MHz RS test as reflected in CCR 7034A.

In table 3.4.3-5 add the EMWIN 1692.7 MHz RS frequency and limit as reflected in CCR 7035.

In tables 5.3.2-3, 5.3.2-4, 5.3.2-5 and 5.3.2-6, clarify the vibration levels as specified in CCR 7037B.

Attachment D, N-Q Sounder Instrument Interface Control Document

Correct table 3.4.1-2, table 3.5.1-6, figure 3.5.2-2, table 3.5.2-4 and table 3.5.4-4 as reflected in CCR 6124.

Document the safhold requirements in 3.8.1 and table 3.4.2-4 as reflected in CCR 6131.

---

Document the part numbers in 3.1.5 and table 3.1.5-1 as reflected in CCR 6133.

In table 3.5.2-7 and section 3.5.3.4, add accuracy, latency, stability information for the IMC and Servo Error telemetry signals in the wideband and MDL data as reflected in CCR 7032.

In table 3.4.3-5 change the field strength for DCPI repeater 468.8 MHz RS test as reflected in CCR 7034A.

In table 3.4.3-5 add the EMWIN 1692.7 MHz RS frequency and limit as reflected in CCR 7035.

In tables 5.3.2-3, 5.3.2-4, 5.3.2-5 and 5.3.2-6, clarify the vibration levels as specified in CCR 7037B.

Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

Change various sections to reflect the numerous corrections and clarifications in CCR 4236.

Revise 3.4.4.1.2-3 and add 3.4.4.1.2-4 and 3.4.4.1.2-5 to reflect a temperature range requirement as reflected in CCR 4238.

In Table 3-26, change the SXI synchronization pulse as reflected in CCR 6117.

Provide for configuration control for the SXI T&C data input and document the PCM data format and serial command format that ACS sends autonomously as reflected in CCR 6119B.

Add harness tie bases to the SXI telescope as reflected in CCR 6125A.

Update the document to Revision B as reflected in CCR 6129.

Attachment L, Interface Control Document for the SXI Ground Support Equipment

Update to Revision B and make administrative changes and corrections as reflected in CCR 6116.

Provide for configuration control for the SXI T&C data input and document the PCM data format and serial command format that ACS sends autonomously as reflected in CCR 6119B.

**2. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 76

Attachment B, Performance Specification

Replace entire document with provided pages.

Attachment B, Performance Specification, Appendix A

Add new page

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**SECTION J OF NAS5-98069  
MODIFICATION NO. 51  
LIST OF ATTACHMENTS**

**J.1 LIST OF ATTACHMENTS (GSFC 52.210-101) (OCT 1988)**

The following attachments constitute part of this contract:

<u>Attachment</u>	<u>Description</u>	<u>Date</u>
A	Statement of Work	August 26, 1997
B	Performance Specification	August 26, 1997
C	GOES-N-Q Imager Interface Control Document	Revision D
D	N-Q Sounder Instrument Interface Control Document	Revision D
E	Interface Control Document for the Solar X-Ray Imager (SXI)	Revision B
F	RESERVED	
G	Contract Document Requirements List	August 26, 1997
H	List of Government Furnished Property	August 26, 1997
I	Program Review Requirements	August 26, 1997
J	Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan	January 12, 1998
K	Performance Based Payments Completion Criteria	August 26, 1997
	Performance Based Payments Completion Criteria (Contractor Provided Milestones)	Revision A September 10, 1998
L	Interface Control Document for the Solar X-Ray Imager Ground Support Equipment and Hughes GOES Satellite (N,O,P,Q) Integration and Test	Revision B

(End of clause)

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 1

AMENDMENT/MODIFICATION NO.

Two (52)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Hughes Space and Communications Co.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-98069

10B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

ACC: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14 (X)

(X)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

X

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification changes the name of Hughes Space and Communications Company to Boeing Satellite Systems, Inc. as reflected in the agreement with DCMA signed February 8, 2001.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

BY Sandra Marshall  
(Signature of Contracting Officer)

16C. DATE SIGNED

3/1/01

(Signature of person authorized to sign)

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT		1. CONTRACT ID CODE	PAGE OF PAGES 1 8
AMENDMENT/MODIFICATION NO. See Attached	3. EFFECTIVE DATE See Blk 16C	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
ISSUED BY DCMA VAN NUYS 6230 Van Nuys Blvd. RM. 4025 Van Nuys, CA 91401-2713	CODE 50512A	ADMINISTERED BY (If other than item 5) CODE	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) Hughes Space & Communications Company P. O. Box 92919 Los Angeles, CA 90009-9219 Attn.: Z. J. Zsydiik (310) 662-6323		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
		10A. MODIFICATION OF CONTRACT/ORDER NO.
		See Attached
		10B. DATED (SEE ITEM 13)
CODE 95831	FACILITY CODE	

### 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

### 12. Accounting and Appropriation Data (If required)

Not Applicable

### 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify Authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 14A.

☒ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

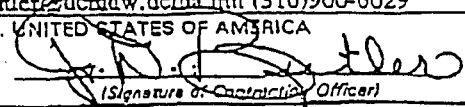
D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

### 14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

See page 2 of 2 for details

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J. D. BUTLER Administrative Contracting Officer jdbutler@dcma.mil (310) 900-6629		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) J. D. BUTLER Administrative Contracting Officer jdbutler@dcma.mil (310) 900-6629	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)	15C. DATE SIGNED	15D. UNITED STATES OF AMERICA BY 	15E. DATE SIGNED 8 Feb 01

7510-C1-152-9070

PREVIOUS EDITION UNUSABLE

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STANDARD FORM 30 (REV. 10-23)  
Prescribed by GSA  
FAR (48 CFR) 53.243

## CONTINUATION SHEET

REFERENCE NO. OF DOCUMENT BEING CONTINUED

PAGE OF PAGES

2

1. A Change of Name Agreement was signed by Boeing Satellite Systems, Inc. and DCM Carson on January 08, 2001. As a result of the Agreement, contracts under Cage Code 92831 were amended by substituting the name Boeing Satellite Systems, Inc. for the name(s) Hughes Space and Communications Company, Hughes Space and Communications, Hughes or HSC wherever it appears in contracts.

2. Hughes Space and Communications Company, by an amendment to its certificate of incorporation, dated 07 October 2000, has changed its corporate name only to Boeing Satellite Systems, INC. and all rights and obligations of the Government and the Contractor under the contracts are unaffected by this change.

3. As a result, the following changes listed below are made:

a. The Contractor's name is changed as follows:

FROM:

Hughes Space and  
Communications Company

TO:

Boeing Satellite Systems, Inc.

b. The Contract Administration Office is changed as follows:

FROM:

Code S0512A  
DCM Van Nuys  
6230 Van Nuys Blvd.  
Van Nuys, CA 91401-27130  
Attn.: J. Butler

TO:

Code S0530A  
DCM Boeing Space and Communications  
Seal Beach  
2600 Westminster Blvd.  
P. O. Box 3644, Bldg. 80, M/S SD32  
Seal Beach, CA 90740-7544

c. The Contractor's alternate remittance address is changed as follows:

FROM:

Hughes Space and  
Communications Company  
P. O. Box 92919  
Los Angeles, CA 90009-9219

TO:

Boeing Satellite Systems, Inc.  
File Number 8765  
Los Angeles, CA 90074-8765

d. The Electronic Funds Transfer address is presented below:

Electronic Funds Transfer (EFT)

Boeing Satellite Systems Inc.  
Bank of America  
ABA: 121-000-358  
Acct. 12334-14041  
Type of Acct: Checking

## Change-Of-Name Agreement

BOEING SATELLITE SYSTEMS, INC. (Contractor), a corporation duly organized and existing under the laws of Delaware, and the UNITED STATES OF AMERICA (Government), enter into this Agreement as of 8 January 2001.

(a) THE PARTIES AGREE TO THE FOLLOWING FACTS:

(1) The Government, represented by various Contracting Officers has entered into certain contracts with the HUGHES SPACE AND COMMUNICATIONS COMPANY and incorporated in this Agreement by reference. The term "contracts," as used in this Agreement, means all contracts including modifications, made by the Government and the Contractor before the effective date of this Agreement (whether or not performance and payment have been completed and releases executed if the Government or the Contractor has any remaining rights, duties, or obligations under these contracts).

(2) The HUGHES SPACE AND COMMUNICATIONS COMPANY, by an amendment to its certificate of incorporation, dated 07 October 2000, has changed its corporate name to BOEING SATELLITE SYSTEMS, INC.

(3) This amendment accomplishes a change of corporate name only and all rights and obligations of the Government and of the Contractor under the contracts are unaffected by this change.

(4) Documentary evidence of this change of corporate name has been filed with the Government.

(b) IN CONSIDERATION OF THESE FACTS, THE PARTIES AGREE THAT --

(1) The contracts covered by this Agreement are amended by substituting the name BOEING SATELLITE SYSTEMS, INC. (BSS) for the name(s) HUGHES SPACE AND COMMUNICATIONS COMPANY, HUGHES SPACE AND COMMUNICATIONS, HUGHES or HSC wherever it appears in the contracts; and



(2) Each party has executed this Agreement as of the day and year first above written.

UNITED STATES OF AMERICA,

By: J. D. Butler

Name: J. D. Butler

Title: Administrative Contracting Officer

BOEING SATELLITE SYSTEMS, INC.

By: Zdzislaw J. Szydlak

Name: Zdzislaw J. Szydlak

Title: Manager, DoD/Civil Contracts

CERTIFICATE

I, M. Keith Nocket, certify that I am the Assistant Secretary of BOEING SATELLITE SYSTEMS, INC; that Zdzislaw J. Szydlak, who signed this Agreement for this corporation, was then an authorized representative of this corporation; and that this Agreement was duly signed for and on behalf of this corporation by authority of its governing body and within the scope of its corporate powers. Witness my hand and the seal of this corporation this eighteenth day of December 2000.

By: M. Keith Nocket

Name: M. Keith Nocket

Title: Assistant Secretary

[CORPORATE SEAL]

HUGHES SPACE & COMM

PIIN SPIIN	CAO	ORG	CAGE	MOD	ACO	ISS BY	EFDT	NAME
TVN0A0 99 0 790N	ND	9E831	ARZ998	NHA	S0539A	97011		HUGHES SPACE & COMMUNICATION
TNVJ0A 99 0 800N	ND	9E831	ARZ996	NHA	S0539A	92307		HUGHES SPACE & COMMUNICATION
N00039 88 C 0300	ND	9E831	ARZ293	NHA	N00039	88211		HUGHES SPACE & COMMUNICATION
N00039 00 9 4002	ND	9E831	ARZ999	NHA	N00039	00220		HUGHES SPACE & COMMUNICATION
N00600 92 D 0208	ND	9E831	ARZ986	NHA	N00600	92071		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008	ND	9E831	ARZ995	N2A	N00244	96359		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LBBB	ND	9E831	AY	NHA	N63200	98353		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LBDC	ND	9E831	AY	NHA	N63200	98353		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LDBD	ND	9E831	AY	NHA	N00244	99259		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LDB1	ND	9E831	AV	NHA	N63200	97001		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LBB2	ND	9E831	AV	NHA	N63200	97001		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LDB3	ND	9E831	AV	NHA	N63200	97001		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LBB4	ND	9E831	AX	NHA	N63200	97273		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LBB6	ND	9E831	AX	NHA	N63200	97349		HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LBB7	ND	9E831	AX	NHA	N63200	97350		HUGHES SPACE & COMMUNICATION

HUGHES SPACE & COMM

PIIN SPIN	CAO ORG	CAGE	MOD	ACO	ISS BY	EFF DT	NAME
N00244 97 D 4008 LBB8	ND	9E831	AX	NHA	N63200	97352	HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 LBB9	ND	9E831	AY	NHA	N63200	98327	HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 0014	ND	9E831	AZ	NHA	N00244	99362	HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 0015	ND	9E831	AZ	NHA	N00244	99362	HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 0016	ND	9E831	AZ	NHA	N00244	99362	HUGHES SPACE & COMMUNICATION
N00244 97 D 4008 0017	ND	9E831	AZ	NHA	N00244	00229	HUGHES SPACE & COMMUNICATION
F04701 00 C 0011	ND	9E831	ARZ999	NHA	FA8808	01002	HUGHES SPACE & COMMUNICATION
F33615 82 C 2213	ND	9E831	ARZ985	NHA	FA8650	82263	HUGHES SPACE & COMMUNICATION
F04701 87 C 0016	ND	9E831	ARZ984	NHA	FA8800	87002	HUGHES SPACE & COMMUNICATION
F04701 77 C 0018	ND	9E831	ARZ993	NHA	FA8800	77001	HUGHES SPACE & COMMUNICATION
F04701 95 C 0018	ND	9E831	ARZ993	NHA	FA8810	95216	HUGHES SPACE & COMMUNICATION
MDA972 96 C 0018	ND	9E831	ARZ995	NHA	HR0011	96274	HUGHES SPACE & COMMUNICATION
00NAS5 99 J 2018	ND	9E831	ARZ996	NHA	DUMMY	92125	HUGHES SPACE & COMMUNICATION
N00014 83 C 2120	ND	9E831	ARZ986	NHA	N00173	83125	HUGHES SPACE & COMMUNICATION
N00039 00 C 3322	ND	9E831	ARZ999	NHA	N00039	99307	HUGHES SPACE & COMMUNICATION

HUGHES SPACE & COMM

PIIN SPIIN	CAO ORG	CAGE	MOD	ACO	ISS BY	EFF D'T	NAME
F04701 97 C 0026	ND	9E831	ARZ993	NHA	FA8808	97141	HUGHES SPACE & COMMUNICATION
F04701 78 C 0126	ND	9E831	ARZ986	NHA	FA8870	78207	HUGHES SPACE & COMMUNICATION
F04701 93 C 0028	ND	9E831	ARZ986	NHA	FA8808	93253	HUGHES SPACE & COMMUNICATION
F04701 99 C 0028	ND	9E831	ARZ998	NHA	FA8808	99235	HUGHES SPACE & COMMUNICATION
TNV510 99 0 213S	ND	9E831	ARZ996	NHA	S0539A	93252	HUGHES SPACE & COMMUNICATION
TNV360 99 2 RW3S	ND	9E831	ARZ996	NHA	S0539A	85304	HUGHES SPACE & COMMUNICATION
F30602 95 C 0030	ND	9E831	ARZ994	NHA	FA8750	95040	HUGHES SPACE & COMMUNICATION
F30602 95 C 0031	ND	9E831	ARZ994	NHA	FA8750	95040	HUGHES SPACE & COMMUNICATION
F04701 94 C 0032	ND	9E831	ARZ994	NHA	FA8807	95031	HUGHES SPACE & COMMUNICATION
F04701 97 C 0033	ND	9E831	ARZ994	NHA	FA8803	97211	HUGHES SPACE & COMMUNICATION
F04701 79 C 0134	ND	9E831	ARZ994	NHA	FA8800	79274	HUGHES SPACE & COMMUNICATION
F04701 87 C 0036	ND	9E831	ARZ985	NHA	PX7056	87244	HUGHES SPACE & COMMUNICATION
F29601 99 2 0149	ND	9E831	ARZ999	NDK	F29601	99309	HUGHES SPACE & COMMUNICATION
F04701 84 C 0057	ND	9E831	ARZ986	NHA	FA8800	85364	HUGHES SPACE & COMMUNICATION
F04701 85 C 0067	ND	9E831	ARZ985	NHA	FA8800	85197	HUGHES SPACE & COMMUNICATION

HUGHES SPACE & COMM

PIIN SPIN	CAO	ORG	CAGE	MOD	ACO	ISS BY	EFF DT	NAME
00NAS5 99 9 8069	ND	9E831	ARZ997	NHA	DUMMY	98028		HUGHES SPACE & COMMUNICATION
N60921 93 C 0079	ND	9E831	ARZ986	NHA	N60921	93089		HUGHES SPACE & COMMUNICATION
F04701 82 C 0086	ND	9E831	ARZ993	NHA	FA8800	82213		HUGHES SPACE & COMMUNICATION
N00014 98 C 0193	ND	9E831	ARZ997	NHA	N00014	98069		HUGHES SPACE & COMMUNICATION

<b>AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE N/A	PAGE OF 1 4
2. AMENDMENT/MODIFICATION NO. Fifty-Three (53)	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. See Block 12	5. PROJECT NO. (If applicable)
ISSUED BY NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		7. ADMINISTERED BY (If other than Item 6) NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE (X)	9A. AMENDMENT OF SOLICITATION NO.	FACILITY CODE 9B. DATED (SEE ITEM 11)
X	10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Clause 52.243-1 Changes Fixed Price—Alt. II
	d. OTHER (Specify type of modification and authority)

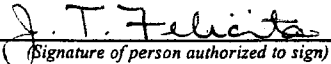

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4256A, 6038C, 6101, 6103, 6123A, 6143A, 6149, 6150A, 6151, 7016B and 7017C at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J.T. Felicita, Manager, NASA Contracts		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall	
15B. CONTRACTOR/OFFEROR  (Signature of person authorized to sign)	15C. DATE SIGNED 1/11/02	16B. UNITED STATES OF AMERICA BY  (Signature of Contracting Officer)	16C. DATE SIGNED 1/15/02

**1. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment A, Statement of Work

Delete the last sentence in 3.5.4 and modify 3.6.2.3.2.3, item 2 to clarify the requirement for maintaining the SPS calibration database as reflected in CCR 6103.

---

Attachment B, Performance Specification, Appendix A, Deviation and Waiver Requests

In 2.0, note the exemptions to specific GIMTACS parts as reflected in CCR 6038C.

In 10.6.2, note the waiver to the maximum junction temperature requirement as reflected in CCR 6101.

In 10.11.3, note the deviation from the outgassing requirement as reflected in CCR6123A.

Attachment C, GOES N-Q Imager Interface Control Document

Add to 2.3 Spacecraft to Ground Database ICD, Rev. B and Software Version Description for the Spacecraft Satellite System Engineering Database, Rev. E as reflected in CCR 6143A.

Add 3.5.6 Database Requirements as reflected in CCR 6143A.

Add Appendix A, Telemetry & Command Database Requirements as defined in CCR 6143A.

Update to Revision F as reflected in CCR 6149.

Revise 3.3.2.6.2, 3.3.2.6.4, 3.5.5.1, 5.7, Figures 3.5.5-1, 3.5.5-2 and Tables 3.5.1-1 and 5.4-1 to incorporate the backup patch heater as reflected in CCR 7017C.

Attachment D, N-Q Sounder Instrument Interface Control Document

Add to 2.3 Spacecraft to Ground Database ICD, Rev. B and Software Version Description for the Spacecraft Satellite System Engineering Database, Rev. E as reflected in CCR 6143A.

---

Add 3.5.6 Database Requirements as reflected in CCR 6143A.

Add Appendix A, Telemetry & Command Database Requirements as defined in CCR 6143A.

Update to Revision F as reflected in CCR 6149.

Revise 3.3.2.6.2, 3.3.2.6.4, 3.5.5.1, 5.7, Figures 3.5.5-1, 3.5.5-2 and Tables 3.5.1-1 and 5.4-1 to incorporate the backup patch heater as reflected in CCR 7016B.

Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

In 3.4.5.3-3, update the GOES ground database inputs for SXI Engineering Model as reflected in CCR 4256A.

Update to Revision C as reflected in CCR 6151.

Attachment L, Interface Control Document for the SXI Ground Support Equipment

Update the document to Revision B and delete two documents in 2.3 as reflected in CCR 6150A.

**2. Replace the contract areas listed below with the enclosed revised pages:**

Contract



Attachment A, Statement of Work

Cover Page  
Section 3.5.4  
Section 3.6.2.3.2.3

---

Attachment B, Performance Specification

Cover Page  
Section 2.0  
Section 10.6.2  
Section 10.11.3

Attachment B, Performance Specification, Appendix A

Add new page

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**SECTION J OF NAS5-98069  
MODIFICATION NO. 53  
LIST OF ATTACHMENTS**

**J.1 LIST OF ATTACHMENTS (GSFC 52.210-101) (OCT 1988)**

The following attachments constitute part of this contract:

<u>Attachment</u>	<u>Description</u>	<u>Date</u>
A	Statement of Work	August 26, 1997
B	Performance Specification	August 26, 1997
C	GOES-N-Q Imager Interface Control Document	Revision F
D	N-Q Sounder Instrument Interface Control Document	Revision F
E	Interface Control Document for the Solar X-Ray Imager (SXI)	Revision C
F	RESERVED	
G	Contract Document Requirements List	August 26, 1997
H	List of Government Furnished Property	August 26, 1997
I	Program Review Requirements	August 26, 1997
J	Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan	January 12, 1998
K	Performance Based Payments Completion Criteria	August 26, 1997
	Performance Based Payments Completion Criteria (Contractor Provided Milestones)	Revision A September 10, 1998
L	Interface Control Document for the Solar X-Ray Imager Ground Support Equipment and Hughes GOES Satellite (N,O,P,Q) Integration and Test	Revision B

(End of clause)

UPDATED TO MODIFICATION 53

**ATTACHMENT A**

---

**S-415-23**

**STATEMENT OF WORK**

**FOR**

**THE GEOSTATIONARY OPERATIONAL  
ENVIRONMENTAL SATELLITE**

**GOES-N,O,P,Q**

**AUGUST 26, 1997**

**NASA/GODDARD SPACE FLIGHT CENTER  
GREENBELT, MARYLAND 20771**

### 3.5.4 SSGS Modifications

The spacecraft contractor shall modify, upgrade, or replace the GOES I-M Telemetry and Command System (GIMTACS) and the Orbit and Attitude Tracking System (OATS) to support the new and changed functions and capabilities of the as-built GOES N-Q spacecraft (backward compatibility of GOES N-Q software to support GOES I-M spacecraft is not required). As indicated in S-415-22, section 7.1.1, the replacement GIMTACS/PACS/IPACS workstations shall be reused. The spacecraft contractor shall provide new GOES N-Q Telemetry Acquisition and Command Transmission Systems (NTACTSs) and new MDL receive systems and archive to support the GOES N-Q spacecraft, as specified in S-415-22, sections 7.1.2 and 7.1.6. The SPSs and PMs shall be used as is, except for changes required by the spacecraft contractor and approved by the government and those required to support the semi-annual spacecraft yaw flip maneuver. (Note: NOAA is pursuing the incorporation of yaw flip capabilities into the GOES I-M SSGS in response to the GOES-10 solar array anomaly. Under current planning these changes will be operational in February 1998.) ~~The spacecraft contractor shall maintain the SPS database containing the Imager and Sounder calibration and navigation constants measured by the instrument contractor, and shall also convert these calibration and navigation constants for use in the SPS.~~ (CCR6103, Mod 53)

#### 3.5.4.1 Hardware

1. The spacecraft contractor shall design, develop, install, integrate, and test all new or modified ground system hardware needed for support of the as-built GOES N-Q spacecraft. On the assumption of client-server architectures and an overall SSGS architecture similar to GOES I-M, operational on-line and redundant quantities to be delivered are as follows (or equivalent quantities depending on the selected architecture):
  - a. NTACTS - Five systems at the WCDAS and two at the backup CDAS.
  - b. GTACS - As a minimum, 4 servers at the SOCC, 2 servers at the WCDAS, and 1 server at the backup CDAS (7 total). The spacecraft contractor shall increase these quantities,

#### 3.6.2.3.2.2.1 Technical Support for Development of ETE Test Procedures

The contractor shall provide personnel, materials, and services in the form of technical expertise required to respond to government requests for assistance in developing command procedures and ETE test procedures through 2001. The requests for assistance will be in the form of verbal (telephone or face-to-face working group meetings) or email. Names and contact telephone numbers of the ROP authors shall be provided to the government to facilitate communications. Additional requests for assistance can be made through the spacecraft contractor Flight Operations Manager or the ROP Development Manager. The flight Operations Manager will maintain a subject log of requests and responses. Contractor responses shall be verbal whenever possible or documented via email when required. Additional existing contractor documentation that may address the requested information will be provided when it is mutually agreed between the contractor and the government that information is appropriate and necessary. The success of ETE tests 3 and 4 will depend on close coordination between the ROP team, the Spacecraft Test Team, and GSFC. The Spacecraft Test Team is responsible for spacecraft and GSE configuration and safety during these events. (CCR4226C, Mod 49)

#### 3.6.2.3.2.3 Thermal Vacuum Testing (Test 3)

The spacecraft contractor shall provide all personnel, services, and materials required to conduct an ETE test while the spacecraft is in thermal vacuum environment conditions. The spacecraft contractor shall support items 1, 3, 4, 6, and 7 and shall perform items 2 and 5 as listed in section 3.6.2.3. These items only apply to the end-to-end portion of thermal vacuum testing.

This test shall consist of three phases:

1. Thermal Vacuum Telemetry Data Flow - Spacecraft subsystem telemetry processing by the ground system will be validated during the extremes of environmental conditions performed as part of the thermal vacuum test program.
2. Instrument Data Validation Test - Spacecraft instrument command scenarios will be exercised during thermal vacuum testing. Tapes of instrument data shall be generated using one of the digital wideband tape recorders required by paragraph 3.5.4.1, item f. These tapes will be subsequently processed at the government operations center ground system for verification and validation of specialized instrument data processing. (CCR6103, Mod 53)
3. INR Validation Test - INR scenarios shall be exercised during thermal vacuum testing and tapes of instrument data shall be generated. The tests shall be designed to exercise the INR signals applied to the instruments and verify system performance of the spacecraft, instruments and ground system. The resulting tapes also will be processed at the government operations center ground system for verification and validation of specialized instrument data processing.

#### 3.6.2.3.2.3.1 Technical Support for Development of ETE Test Procedures

The contractor shall provide personnel, materials, and services in the form of technical expertise required to respond to government requests for assistance in developing command procedures and ETE test procedures through 2001. The requests for assistance will be in the form of verbal (telephone or face-to-face working group meetings) or email. Names and contact telephone numbers of the ROP authors shall be provided to the government to facilitate communications. Additional requests for assistance can be made through the spacecraft contractor Flight Operations Manager or the ROP Development Manager. The flight Operations Manager will maintain a subject log of requests and responses. Contractor responses shall be verbal whenever

possible or documented via email when required. Additional existing contractor documentation that may address the requested information will be provided when it is mutually agreed between the contractor and the government that information is appropriate and necessary. The success of ETE tests 3 and 4 will depend on close coordination between the ROP team, the Spacecraft Test Team, and GSFC. The Spacecraft Test Team is responsible for spacecraft and GSE configuration and safety during these events. (CCR4226C, Mod 49)

#### **3.6.2.3.2.4 Final Procedure and Database Validation (Test 4)**

The spacecraft contractor shall provide all personnel, services, and materials required to conduct an ETE test to demonstrate final LOR, PLT and normal operations nominal and contingency procedures (COPs). This test will confirm all modifications to command procedures and telemetry processing as a result of all lessons learned from prior ETE tests. Any required regression testing, including testing of any pre-shipment spacecraft hardware/software unit changes that effect either Telemetry and Command interfaces or operational procedures, shall be performed as well. This test shall occur after final thermal vacuum testing and before the shipment of the spacecraft to the launch site. The spacecraft contractor shall perform all seven activities listed in section 3.6.2.3. (CCR4226C, Mod 49)

#### **3.6.2.3.2.5 Launch Base Final Operations Evaluation (Test 5)**

The spacecraft contractor shall provide all personnel, services, and materials required to conduct a final telemetry data flow from the launch facility. This test will provide a final pre-launch verification of spacecraft subsystem telemetry processing at the government operations center. The spacecraft contractor shall perform all seven activities listed in section 3.6.2.3.

#### **3.6.2.4 Mission Operations Simulations**

The spacecraft contractor shall provide any personnel, services, and materials required to support a minimum of five training simulations for rehearsal of critical launch and on-orbit mission phases: (CCR4226C, Mod 49)

- a. LV dress rehearsal (GOES-N)
- b. LOR with contingencies (GOES-N)
- c. On-station operations (GOES-N)
- d. On-station contingencies (GOES-N)
- e. On-station PLT contingencies (GOES-N)
- f. A dress rehearsal of the S/C LOR phase approximately 1 month prior to each launch (Deleted)
- g. A development LOR rehearsal at the SOCC for each launch occurring more than one year after the previous GOES launch. This rehearsal would be conducted at approximately L-6 months (Deleted)

This includes one dress rehearsal of the launch to separation sequence for each spacecraft, one nominal LOR simulation, one nominal operations simulation, and two simulations of contingencies during LOR, PLT, and normal operations phases. These simulations shall be supported by government participation. The DSN will be made available by the government for simulation purposes, if needed and requested.

#### 3.6.2.4.1 Launch Network Countdown Simulations

The spacecraft at the launch base shall provide real-time telemetry to the government operations center on a non-interfering basis while it is in the payload processing facility and in a launch configuration. The spacecraft shall provide real-time telemetry to the government operations center while it is on the launch pad and in a launch configuration in support of a final countdown launch simulation.

Network readiness tests shall be conducted during ETE test 5 and approximately 2-3 days prior to launch to ensure readiness of the DSN ground stations and other network elements required to support launch and mission operations. These will take approximately one day and involve voice and data communications between the facilities. Additional network readiness tests shall be performed as part of: (CCR4226C, Mod 49)

- a. LOR rehearsal at SOCC data files and mission protocols from DSN
- b. Spacecraft dress rehearsal at SOCC

#### 3.6.2.4.2 Pre-launch Spacecraft Data Flows

The spacecraft shall provide real-time telemetry to the government operations center on an as available basis during the final two weeks before launch. This includes telemetry flows to the government operations center while the final launch configuration is being set.

#### 3.6.2.5 Procedure Development

The spacecraft contractor shall provide all personnel, services and materials required to develop all orbit raising procedures, including bus checkout procedures. The spacecraft contractor shall provide these procedures to NASA for final approval. NASA retains responsibility for, and execution of, GFE instrument procedures and activities. NASA also retains responsibility for development of all on-orbit operations procedures based on spacecraft contractor supplied outlines. NASA will provide all procedures to the spacecraft contractor for review.

##### 3.6.2.5.1 Contingency Procedures

The spacecraft contractor shall provide all personnel, services, and materials required to create a complete set of contingency operations procedures (COPs) covering all spacecraft bus operations prior to the engineering handover, as described in following section 3.6.3.3. The spacecraft contractor shall also provide any personnel, services and materials required by NASA for the creation of on-orbit COPs. The spacecraft contractor shall provide new COP outlines required by any new hardware or software changes for GOES-O,P,Q. COPs for GFE instruments shall be developed by NASA and incorporated into the spacecraft contractor-supplied COPs.

#### 3.6.2.6 Training Program

The spacecraft contractor shall provide all personnel, services, and materials necessary to deliver and present a training program to the GOES N-Q government team, in accordance with CDRL OPS-3.6.1-02. The training shall be performed at a government furnished facility located near GSFC. The training program shall consist of not less than 120 hours of classroom training. The training shall consist of detailed subsystem analysis, including design and development overviews, detailed engineering drawing reviews, operations concepts, hardware/software interfaces, and a description of the resolution of all problems encountered in the subsystem

development for which an Engineering Change Request was generated. The training shall also include interfaces with the ground system, and changes and/or upgrades that affect INR. All training presentations shall be videotaped for archival purposes. (CCR4226C, Mod 49)

Phase 2 training shall provide spacecraft training for approximately 150 NASA/NOAA real-time operations, engineering, and support personnel. (CCR4226C, Mod 49)

GOES-N phase 2 training shall be provided no later than 12 months before launch. For GOES O-Q, the phase 2 training shall be abbreviated to include only baseline changes and unique features or problems encountered with the specific spacecraft. For GOES O-Q the training shall be provided no later than 6 months prior to launch. The spacecraft contractor shall videotape all phase 2 training. (CCR4226C, Mod 49)

The spacecraft contractor shall provide six mission operations training tools (spacecraft models 1/24 scale). The spacecraft contractor shall supply 14 additional mission operations training tools (spacecraft models 1/48 scale). (CCR4142A, Mod 29; CCR4225, Mod 43)

### 3.6.2.7 Systems Engineering Support

The spacecraft contractor shall provide flight operations related systems engineering support in the following: (CCR4226C, Mod 49)

1. The spacecraft contractor shall provide the government with systems engineering support for the integration of ground system procedures and directives with ROPs for the purpose of generating control room console manuals. This systems engineering support shall consist of participation in working group meetings, consultation with government personnel charged with this integration, and review of the integrated product to verify its technical accuracy and completeness. (CCR4226C, Mod 49)
2. The spacecraft contractor shall provide the government with systems engineering support in the development and implementation of the post launch test program. This systems engineering support shall consist of participation in PLT working group meetings and consultation with government personnel charged with test plan development and implementation. For the GOES-N spacecraft, approximately 250 tests will be planned for all spacecraft subsystems and the SSGS. For the purpose of estimation, PLT working groups requiring this support shall occur every other month over the course of a one-year period. Each working group meeting shall last for a one-week duration, either at the spacecraft contractor facility or via teleconference. (CCR4226C, Mod 49)
3. The spacecraft contractor shall provide the government with systems engineering support in the development of control room documentation. This systems engineering support shall consist of providing the government with electronic copies (in editable text format) of information to be included in the control room documents, technical consultation with government personnel charged with documentation development, and technical review of the documents. (CCR4226C, Mod 49)
4. The spacecraft contractor shall provide the government with systems engineering support in the development of GTACS hyperlinks to spacecraft subsystem block diagrams and COPs associated with critical alarms. This systems engineering support shall consist of providing the government with electronic copies (in editable text format) of information to be included in the hyperlinks, and technical consultation with government personnel charged with their development.



5. The spacecraft contractor shall conduct working group meeting with the government to define the scope and lists of COPs to be developed. (CCR4226C, Mod 49)

#### 3.6.2.8 Mission Operations Working Group (MOWG)

The contractor shall provide personnel, materials, and services required to support a series of 26 working group meetings to address issues associated with mission pre-launch activities and related ground hardware and software activities in preparation for the successful launch, test, and on-orbit operations of the GOES N-Q spacecraft. (CCR4226C, Mod 49)

The MOWG shall meet monthly, alternating location of the meetings between spacecraft contractor in El Segundo, CA and GSFC/NOAA in the Washington D.C. area. The agenda for each MOWG meeting shall be developed in advance by mutual agreement of the government and contractor representatives. (CCR4226C, Mod 49)

The contractor shall identify any actions requested by the Government, such as analyses or document generation, which are determined to be outside the scope of the basic contract. For such requests, the contractor shall provide to the government an estimate of the additional manpower required and any potential program impact. If the government agrees that the action is out of scope and requires that the additional task be performed under a Task Assignment or an appropriate CCR shall be written. The contractor shall create and maintain an action item log that will be statused at each meeting of the MOWG. (CCR4226C, Mod 49)

#### **3.6.3 Launch and Orbit Raising (LOR) Support**

The spacecraft contractor shall provide personnel, services, and materials required to perform launch preparations, launch support, orbit raising maneuvers, spacecraft appendage deployments, spacecraft bus and SEM instrument checkout, and support for NASA to perform GFE instrument operations. NASA has requirements for certain activities during the orbit raising phase as described in S-415-22, section 6.2.2. The spacecraft contractor shall provide a mission profile in accordance with CDRL OPS-3.6.1-01.

Orbit raising activities shall be conducted by the spacecraft contractor from a government operations center facility. NASA retains responsibility for all GFE instrument activities through engineering handover.

##### **3.6.3.1 Engineering Support**

The spacecraft contractor shall provide continuous engineering support during the LOR mission phase, i.e., from launch through engineering handover. This includes performing all monitoring and analysis functions, executing all orbital maneuvers, and deploying all spacecraft appendages. GFE instrument deployments shall be performed by NASA.

##### **3.6.3.2 Spacecraft Checkout**

The spacecraft contractor shall provide all personnel, services, and materials required to complete the orbit raising within 18 days and perform spacecraft bus checkout within 6 days thereafter.

**\*Updated to Modification 53\***

**ATTACHMENT B**

**S-415-22**

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**PERFORMANCE SPECIFICATION  
FOR THE  
GEOSTATIONARY OPERATIONAL ENVIRONMENTAL  
SATELLITE  
GOES-N,O,P,Q**

**AUGUST 26, 1997**

**NASA/GODDARD SPACE FLIGHT CENTER  
GREENBELT, MARYLAND 20771**

## 2.0 APPLICABLE DOCUMENTS

The documents listed in this section are those referenced in the various sections of this specification. The documents establish detailed specifications, requirements, and interface information necessary for the performance of the GOES N,O,P,Q contract. Unless otherwise specified, the document version in effect at the time the contract is executed shall apply. The order in which the documents are listed is not intended to imply any precedence:

- Statement of Work for the GOES-N,O,P,Q, S-415-23, June 1997.
- NASA/GSFC Document S-415-28.
- Fastener Integrity Requirements, GSFC S-313-100.
- Contract Data Requirements List for the GOES-N,O,P,Q Program, S-415-26, June 1997.
- Program Review Requirements for the GOES-N,O,P,Q Program, S-415-27, June 1997.
- Interface Control Document for the GOES-N,O,P,Q Imager; ITT #8175726, 13 Mar. 1997.
- Interface Control Document for the GOES-N,O,P,Q Sounder, ITT #8175751, 1997.
- Interface Control Document for the Solar X-ray Imager, S-415-25, Mar. 1997.
- Interface Control Document for Imager and Sounder Test Equipment and the NO/PQ Spacecraft Ground Support Equipment/Facilities and Spacecraft Launch Facilities (GSE-ICD), ITT #8175788, Draft-Revision B, Aug. 1997.
- GOES NO/PQ CDRL 4-12, Imager Instrument Navigation and Registration Performance Analysis Summary, ITT, Jan. 1997.
- GOES Program - DRL 504-11, Earth Location User's Guide, NOAA/NESDIS, May 1997.
- FED-STD-209.
- JPL Document 810-5, Rev D.
- MIL-STD-461C.
- MIL-STD-462.
- MIL-STD-1246.
- MIL-STD-1522A.
- MIL-STD-1541A.
- MIL-STD-1553B.
- NHB-8071.1.
- MSFC-SPEC-522B.
- CCSDS Recommendations for Radio Frequency and Modulation Systems, CCSDS 401, Sept. 1989.
- ASTM E1417, Standard Practice for Liquid Penetrant Examination.
- International Telecommunications Union (ITU) Radio Regulations, Article 28, 1982 Edition.
- Atlas Launch System Mission Planner's Guide, Lockheed Martin Commercial Launch Services, Inc., Revision 6, Feb. 1997.
- Delta III Payload Planners Guide, McDonnell Douglas Aerospace, Apr. 1996.
- Design Guidelines for Assessing and Controlling Spacecraft Charging Effects, NASA Technical Paper 2361.
- Charged Particle Radiation Exposure of Geostationary Orbits for the GOES N,O,P,Q Satellite Program, GSFC Document X-900-97-004.
- The Astronomical Almanac, U.S. Naval Observatory.
- Meeus, J., Astronomical Formulae for Calculators, Willman-Bell, Inc.
- GOES I-M Telemetry and Command System (GIMTACS) Functional Specification, NOAA/ NESDIS, 22 Feb. 1988). **Note: Refer to CCR6038 (Waiver Request) in Appendix A (Mod 53)**
- GOES I-M Telemetry and Command System (GIMTACS) User's Guide, LMSMS&S.

- GOES IJK/LM GOES Engineering Analysis System (GEAS) Architecture, Operations, and Maintenance Manual, NOAA/NESDIS, May 1997.
- GOES IJK/LM GOES Engineering Analysis System (GEAS) User's Guide, NOAA/NESDIS, Apr. 1997.
- GOES IJK/LM DEChub 900 MultiSwitch and HUBwatch User's Guide, NOAA/NESDIS, May 1997.
- TACTS Overview and Configuration Manual; Version 3.1, Westinghouse Electric Corporation (WEC), Apr. 1991.
- Interface Definition Document for GOES I-M TACTS, Version 2.0, WEC, Mar. 1989.
- TACTS Operator Manual, Version 2.0, WEC, 20 Feb. 1991.
- GOES IJK/LM Operations Ground Equipment (OGE), DRL 504-02 - Operations Ground Equipment (OGE) Interface Specification - Part 1, NOAA/NESDIS, Apr. 1997.
- GOES IJK/LM Operations Ground Equipment (OGE) Operations and Maintenance Manuals, DRL 504-06, NOAA/NESDIS:
  - Part 2 of 22, Sensor Processing System (SPS) Hardware Manual, Feb. 1997.
  - Part 17 of 22, Sensor Processing System (SS) Software Maintenance Manual, Feb. 1997.
  - Part 11 of 22, Sensor Processing System (SPS) User's Manual, Apr. 1997.
  - Part 4 of 22, Product Monitor (PM) Hardware Manual, ISI, Aug. 1994.
  - Part 18 of 22, Product Monitor (PM) Software Maintenance Manual, ISI, Nov. 1994.
  - Part 12 of 22, Product Monitor (PM) User's Manual, Draft, ISI, Oct. 1996.
  - \*Part 10 of 22, Dynamic Interaction Diagnostic (DID) System Hardware Manual, Apr. 1997.
  - \*Part 20 of 22, Dynamic Interaction Diagnostic (DID) Software Maintenance Manual, Apr. 1997.
  - \*Part 14 of 22, Dynamic Interaction Diagnostic (DID) User's Manual, Apr. 1997.
  - Part 7 of 22, Orbit and Attitude Tracking System (OATS) Hardware Manual, Feb. 1997.
  - \*Part 22 of 22, Orbit and Attitude Tracking System (OATS) Software Maintenance Manual, Rev C, SS/L, Aug. 1995. (New draft expected in July 1997.)
  - Part 16 of 22, Orbit and Attitude Tracking System (OATS) User's Manual, Feb. 1997.
  - \*Rehosted OATS Requirements Overview, NOAA/NESDIS, 30 November 1993.
- Mewe and Groenschild, Astronomical Astrophysics Supplemental Series, Vol 45, pp 11-52, 1981.
- GOES Contamination Analysis Final Report.
- Interface Control Document for Imager and Sounder Test Equipment and the N-Q Spacecraft Ground Support Equipment/Facilities and Spacecraft Launch Facilities (GSE ICD), Rev - (MOD51, CCR6136)

Admin change  
date per CCR  
6040A  
MOD 40

(\*Note: Refer to Appendix C for specific exempt parts to the indicated documents  
CCRS: 6036A, 6037A, 6040A, 6035A, 6039, and 6042) (Mod 36)

power shall not flow on primary returns, and DC currents shall not flow through the chassis. Secondary power returns shall be referenced to chassis with an impedance sufficient to meet the requirements of section 8.4, including the common mode noise requirements of section 8.4.11. The chassis shall be used as a zero signal reference plane for RF, fast rise time signals, and sensitive sensor front ends (multipoint ground concept). All interfaces between boxes shall be designed for compliance with the common mode noise requirements of 8.4.11. (MOD 40, CCR 6051B)

Where converters are cascaded (the output of one converter is connected to the input of another), a new single point primary power ground reference (node) may be selected to establish a minimum impedance reference.

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**10.5.7 Short Circuit Prevention** - The GOES N-Q spacecraft shall prevent a short circuit in any component from damaging any other component.

**10.5.8 Non-fused Power Lines** - The GOES N-Q spacecraft non-fused power lines shall be double-insulated.

**10.5.9 Power Regulators/Power Supplies** - All power regulators/power supplies shall be stable. They shall not oscillate when operated with any operational loads and subjected to any operational environmental conditions contained in this specification. The power regulators/power supplies shall also be stable and not oscillate when operated at any load conditions between 20% above maximum operational load power and 20% below minimum operational load power. The power regulators/power supplies shall have a phase margin of better than  $45^\circ$  and a gain margin of better than 12 dB.

## 10.6 Thermal Control

**10.6.1 General Requirement** - The spacecraft and instruments shall meet the requirements of this specification during all encountered thermal environments (system level test, launch through transfer orbit, synchronous orbit, and on-orbit storage mode).

**10.6.2 Design Requirement** - The thermal design shall maintain the spacecraft and instrument subsystems and components within their MAT limits during system level thermal balance and thermal performance testing, and also during all phases of the mission including on-orbit storage. All transistor collector junction temperatures shall be below  $110^\circ\text{C}$ . Note: Refer to CCR6101 (Waiver Request) in Appendix A (Mod 53)

**10.6.3 Uncertainties** - Predicted temperatures showing compliance with 10.6.1 and 10.6.2 shall account for all uncertainties in calculations, thermal parameters and measurements.

## 10.7 Structural

**10.7.1 General Requirements** - The structural subsystem consists of all spacecraft structural elements, including fixed appendages. A series of tests and analyses shall be conducted to demonstrate the flight hardware is qualified for the expected mission environments, including structural loads, vibroacoustics, sine vibration, mechanical shock, and pressure profiles. The hardware design must also comply with specified verification requirements, such as factors of safety, interface compatibility, structural reliability, workmanship, and associated system safety elements. The spacecraft shall accommodate hard point interfaces for operations such as lifting, rotating, and transporting.

**10.11.3 Outgassing Requirements** - In order to minimize outgassing of the overall system, all spacecraft and launch vehicle nonmetallic materials shall be screened for total mass loss (TML) and collected volatile condensable material (CVCMM) when exposed to a vacuum environment. Polymeric materials shall be screened to meet  $\leq 1.0\%$  for TML and  $\leq 0.1\%$  for CVCMM. Special processing or high temperature vacuum bakeouts are permitted to qualify a high outgassing material, with GSFC concurrence. Refer to NASA RP 1124 for material outgassing data.

All multilayer insulation (MLI) and spacecraft surfaces located near the instrument optical ports and cooler surfaces shall be vacuum baked to meet the following outgassing rate requirement: an outgassing rate of  $6.55 \times 10^{-9} \text{ g/cm}^2\text{-hr}$  as measured with a 15 MHz (sensitivity of  $1.56 \times 10^{-9} \text{ g/cm}^2\text{-Hz}$ ) temperature-controlled quartz crystal microbalance (TQCM) averaged over an 8-hour period. The TQCM measurement shall utilize an outgassing test box where the TQCM sensor is located inside a control vented test box. The temperature of the hardware shall be  $10^\circ\text{C}$  above the maximum on-orbit predicted temperature, and the TQCM shall collect at  $-10^\circ\text{C}$  below the on-orbit instrument coldest exposed temperature. All MLI and spacecraft vents shall be directed away from the Imager and Sounder instrument optical ports and cooler surfaces, and away from the SXI optical and thermal control surfaces.

Outgassing rates for the solar array shall be established based upon the performance degradation of the SXI optical and thermal surfaces according to on-orbit operational temperatures. All spacecraft panel surfaces with a view to the SXI radiator and aperture plate shall be vacuum baked. MOLEFLUX or equivalent modeling analyses shall be performed using outgassing rates from the solar array and panel surfaces with a view of the SXI to ensure the SXI performance requirements have not been compromised. To minimize deposition on the SXI, the solar array and panel surface, outgassing rates shall be less than  $3.12 \times 10^{-7} \text{ g/cm}^2\text{-hr}$  as measured on both sides of the solar array using a 15 MHz (sensitivity of  $1.56 \times 10^{-9} \text{ g/cm}^2\text{-Hz}$ ) TQCM averaged over an 8-hour period. The TQCM FOV shall be completely filled by the solar array. The outgassing rate shall be measured with the solar array at  $10^\circ\text{C}$  above the maximum on-orbit operating temperature, and the TQCM at  $10^\circ\text{C}$  below on-orbit operating temperature of the SXI aft radiator plate.

(Note: Please refer to Appendix A, Deviation and Waiver Requests for Paragraph 10.11.3) (MOD 24, CCR 6004; MOD 36, CCR 6058; MOD 40 CCR 6072, CCR 6046A, CCR 6045A; MOD 48 CCR 6074, CCR 6081, CCR 6099, MOD 53 CCR6123A)

**10.11.4 Plume Impingement** - All ascent, transfer orbit, and station keeping thruster firings shall be analyzed to determine if any of the cleanliness requirements in section 10.11.2 are exceeded during the mission life.

**10.11.5 Purge Requirements** - Refer to the GFE instrument ICDs and CDRL SDA-3.2.17-01 for instrument purge requirements and launch vehicle requirements.

**10.11.6 Storage and Transportation** - During storage and transportation periods, the spacecraft and instruments shall be bagged in ESD protective material meeting surface cleanliness requirements and facility requirements. The hardware or representative witness samples shall be examined/changed out every 6 months during extended storage periods. Any storage containers used during spacecraft storage periods shall not be opened or stored in environments other than those specified in section 10.11.1.

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1

2

2. AMENDMENT/MODIFICATION NO.

Fifty-four (54)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(x)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.

NAS5-98069

10B. DATED (SEE ITEM 13)

01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

BX B/NC: 427 See Page 2

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X

d. OTHER (Specify type of modification and authority)

Unilateral Modification; Clause H.6 LIMITATION OF FUNDS

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$30,000,000 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)

BY

(Signature of Contracting Officer)

1. In Clause H.6, increase the funding from \$287,628,313 by \$30,000,000 to \$317,628,313. The period of allotment is from the effective date of the contract through December 21, 2001 in accordance with the contractor's correspondence dated April 26, 2001.

2. Block 12 Accounting and Appropriation Data:

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PCN: 415-02702A(1C)  
JON: 415-616-41-81-11  
APP: 801/20110(01)  
BLI: A703  
OC: 41-2550  
AMT: \$30,000,000

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION



**SECTION H OF NAS5-98069  
MODIFICATION NO. 54  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$317,628,313 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:

**SECTION H OF NAS5-98069  
MODIFICATION NO. 54  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until December 21, 2001.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

<b>AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE N/A		PAGE OF 1   2
2. AMENDMENT/MODIFICATION NO. Fifty-five (55)	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. See Block 12	5. PROJECT NO. (If applicable)	
ISSUED BY NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		7. ADMINISTERED BY (If other than Item 6) NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles		

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE (X)	9A. AMENDMENT OF SOLICITATION NO.	FACILITY CODE 9B. DATED (SEE ITEM 11)
X	10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)  
BX B/NC: 427 N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	d. OTHER (Specify type of modification and authority) Mutual Agreement

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification revises Attachment K Performance Based Payments Completion Criteria for event number N56 in Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS to reflect the Contracting Officer's Technical Representative approval.  
Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J.T. Felicita, Manager, NASA Contracts		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall	
15B. CONTRACTOR/OFFEROR <u>J. T. Felicita</u> (Signature of person authorized to sign)	15C. DATE SIGNED 7/3/01	16B. UNITED STATES OF AMERICA BY <u>Sandra Marshall</u> (Signature of Contracting Officer)	16C. DATE SIGNED 7/9/01

**1. In Clause J.1 LIST OF ATTACHMENTS, make the following change:**

Attachment K, Performance Based Payments Completion Criteria

---

Change the Completion Criteria for Milestone N56, Deliver Ground System SOCC/CDAS's from 4 to 6.

**2. Replace the contract areas listed below with the enclosed revised page:**

Attachment K

Page 3

END OF MODIFICATION

No.	Title	Generic Description
15	Ground System Design Complete	Hardware and software designs complete, site ready and facility specification complete.
16	Start Ground System Integration	The ground system hardware and satellite operating software is delivered.
17	Ground System Complete	The ground system hardware and software are complete, installed at the customer site, and the site acceptance testing is complete, with all anomalies resolved and closed.
18	Mission Complete	The transfer orbit and in-orbit test operations are complete. All anomalies are resolved. The satellite is configured for on-station operations.

**GOES N**

Milestone	Description	Completion Criteria
N2A.	Preliminary Design Review Updates	1
N37A.	EDDS Hardware / Software Interface	1
N41.	GOES N and O Team Kickoff	1
N42.	Contract Award to Panametrics for SEM Instruments	2
N43.	Deliver Engineering Communications Model Data	3
N44.	S/C Emulator & PES PDR	1
N45.	Gate 3 - GOES Bus Layout Complete	5
N46.	Gate 5 - GOES Antenna Design Complete	5
N47.	RESERVED	
N48.	GTACS/NTACTS Proof-of-Concept Demo	6
N49.	Gate 4 - GOES Payload Layout Complete	5
N50.	Communication Subsystem CDR	1
N51.	RESERVED	
N52.	Version Description Document - Build 4	3
N53.	RESERVED	
N54.	Deliver Flight Communications Model Data	4
N55.	Gate 7 - Start Bus Integration	5
N56.	Deliver Ground System SOCC/CDASs	6
N57.	Gate 9 - Bus Complete	5
N58.	GOES N End-to-End Test 1A Completed	6
N59.	Flight Operations Training Program Completed	6
N60.	Spacecraft Training Program Plan (Final)	3
N61.	Complete Fit Check	6
N62.	GOES N End-to-End Test 2 Completed	6
N63.	Launch Site Test Procedures	3

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1

2

2. AMENDMENT/MODIFICATION NO.

Fifty-six (56)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

FACILITY CODE

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.

NAS5-98069

10B. DATED (SEE ITEM 13)

01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX

B/NC: 427

See Page 2

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

d. OTHER (Specify type of modification and authority)

Unilateral Modification; Clause H.6 LIMITATION OF FUNDS

E. IMPORTANT: Contractor



is not,



is required to sign this document and return

copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$26,200,000 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

BY

16C. DATE SIGNED

(Signature of person authorized to sign)

(Signature of Contracting Officer)

7540-01-152-8070

30-105

STANDARD FORM 30 (Rev. 10-83)

PREVIOUS EDITION UNUSABLE

Prescribed by GSA

1. In Clause H.6, increase the funding from \$317,628,313 by \$26,200,000 to \$343,828,313. The period of allotment is from the effective date of the contract through June 21, 2002 in accordance with the contractor's correspondence dated July 18, 2001.

2. Block 12 Accounting and Appropriation Data:

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PCN: 415-02718A(1C)	415-02719A(1C)	415-02726A(1C)
JON: 415-616-41-81-11	415-616-41-81-11	415-616-41-81-11
APP: 801/20110(01)	801/20110(01)	801/20110(01)
BLI: A704	A705	A706
OC: 41-2550	41-2550	41-2550
AMT: \$640,699	\$559,301	\$25,000,000

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 56  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$343,828,313 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:



**SECTION H OF NAS5-98069  
MODIFICATION NO. 56  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until June 21, 2002.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

<b>AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE N/A	PAGE OF 1   2
2. AMENDMENT/MODIFICATION NO. Fifty-seven (57)	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. See Block 12	5. PROJECT NO. (If applicable)
ISSUED BY CODE NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		7. ADMINISTERED BY (If other than Item 6) CODE NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)			

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE	FACILITY CODE
(X) 9A. AMENDMENT OF SOLICITATION NO.	9B. DATED (SEE ITEM 11)
X 10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

## ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	d. OTHER (Specify type of modification and authority) Mutual Agreement

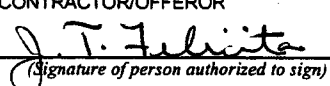
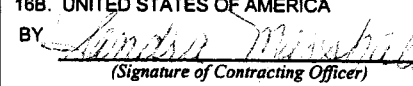
E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification revises clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS and Attachment K Performance Based Payments Completion Criteria at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J.T. Felicita, Manager, NASA Contracts	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall
15B. CONTRACTOR/OFFEROR  (Signature of person authorized to sign)	15C. DATE SIGNED 8/14/01
15B. CONTRACTOR/OFFEROR  (Signature of Contracting Officer)	16C. DATE SIGNED 8/15/01

NSN 7540-01-152-8070

30-105

PREVIOUS EDITION UNUSABLE

STANDARD FORM 30 (Rev. 10-83)

Prescribed by GSA

**1. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, make the following changes:**

Decrease N84, GRODAS Implementation from \$5,000,000 to \$1,000,000.

Add N92, GRODAS Data Flow Demonstration, \$4,000,000, 8/01/01.

---

**2. In Clause J.1 LIST OF ATTACHMENTS, make the following change:**

Attachment K, Performance Based Payments Completion Criteria

Add N92, GRODAS Data Flow Demonstration with a completion criteria of 6.

**3. Replace the contract areas listed below with the enclosed revised page:**

Contract

Page 16

Attachment K

Page 4-6

END OF MODIFICATION

**SECTION B OF NAS5-98069  
MODIFICATION NO. 57  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N80.	HSE Delivery to ITT for RTP Checkout	\$3,100,000	11/01/00
N81.	Red Team Kick-off Review	\$8,000,000	2/15/01
N82.	GOES N Solar Array Power Test	\$8,000,000	3/15/01
N83.	System Verification Review	\$7,000,000	3/15/01
N84.	GRODAS Implementation	\$1,000,000	4/15/01
N85.	Phase I SSGS Training	\$1,362,529	6/15/01
N86.	Solar Thermal Balance Test of Solar Array Yoke	\$3,000,000	6/15/01
N87.	EDDS Upgrade Acceptance	\$1,000,000	6/15/01
N88.	Completion of Spare Comm Boxes	\$1,021,539	9/14/01
N89.	Delivery of SSGS Mods	\$1,000,000	11/15/01
N90.	HSE Acceptance	\$1,000,000	1/15/02
N91.	Delivery of INR Analytical Tools	\$500,000	5/15/02
N92.	GRODAS Data Flow Demonstration	\$4,000,000	8/01/01

**GOES O**

**Spacecraft System Level Reviews**

O1.	Critical Design Review	\$2,000,000	2/11/00
O2.	Mission Operations Review	\$8,100,000	4/2/02
O3.	Pre-Environmental Review	\$6,700,000	4/18/02
O4.	Pre-Storage Review	\$12,000,000	12/11/02
O4A.	Pre-Shipment Review	\$500,000	12/11/03
O5.	Flight Operations Review	\$1,000,000	1/9/04
O6.	Spacecraft Launch Readiness Review	\$500,000	4/4/04

**GOES N**

N64.	INR System Description and Analysis Document (Final)	3
N65.	Contingency Simulation # 1	6
N66.	Dress Rehearsal	6
N67.	GOES N Data Book	6
N68.	GOES N End-to-End Test 4 Completed	6
N69.	Algorithm Design Description – Build 3	6
N70.	1553 Data Bus Diagnostics Features Meeting	6
N71.	PES ADD Walk-Thru Review	1
N72.	PES Prototype GUI Demo	6
N73.	PES Delivery	4
N74.	Wideband Tape Recorder Delivery & Training	6
N75.	Safehold Mode Proposal	6
N76.	Electronic Data Distribution System & Configuration Management Review	1
N77.	Rebaseline Schedule Review	1
N78.	Integration and Test (I&T) Review	1
N79.	1 <sup>st</sup> Powered Testing of GOES N Bus Module	6
N80.	HSE Delivery to ITT for RTP Checkout	6
N81.	Red Team Kick-off Review	1
N82.	GOES N Solar Array Power Test	6
N83.	System Verification Review	1
N84.	GRODAS Implementation	6
N85.	Phase I SSGS Training	6
N86.	Solar Thermal Balance Test of Solar Array Yoke	6
N87.	EDDS Upgrade Acceptance	6
N88.	Completion of Spare Comm Boxes	6
N89.	Delivery of SSGS Mods	6
N90.	HSE Acceptance	4
N91.	Delivery of Analytical Tools	6
N92.	GRODAS Data Flow Demonstration	6

**GOES O**

Milestone	Description	Completion Criteria
O29.	Gate 7 - Start Bus Integration	5
O30.	Gate 9 - Bus Complete	5
O31.	Gate 10 - Payload Complete	5
O32.	Bus & SEM Instruments Integration & Test Complete	6

**GOES O**

O33.	XRS/EUV/EPS/HEPAD Flight Unit#2 (N-O Spares) Pre-Shipment Review	1
O34.	Gate 12 - GOES O S/C to System Test	5
O35.	Gate 13 - GOES O S/C Complete	5
O36.	GOES O End-to-End Test 4 Completed	6
O37.	Gate 7U.5 - GOES O Bus Propulsion Subsystem Complete	5
O38.	Gate 11 - GOES O Antenna to Integration	5
O39.	Gate 12A - Solar Wing to System Test	5
O40.	GOES O Bus Interface Verification Test	6
O41.	GOES O Yoke Electrical Testing	6
O42.	GOES O End-to-End Test 2 Completed	6

**GOES P**

Milestone	Description	Completion Criteria
P29.	Kickoff Meeting	1
P30.	Deliver Launch Services Proposal	3
P31.	Manufacturing Readiness Review	1
P32.	Preliminary Design Review (If req'd)	1
P33.	Transfer SEM instruments from precontractual stores	6
P34.	Communication Subsystem to Integration	6
P35.	T&C Subsystem to Integration	6
P36.	Gate 11 - Antenna to Integration	5
P37.	ACS Subsystem to Integration	6
P38.	Gate 9 - Bus Complete	5
P39.	Bus & SEM Instruments Integration & Test Complete	6
P40.	S/C Unit Integration Complete	6
P41.	SEM Instruments Integration & Test	6
P42.	Gate 12 - S/C to System Test	5
P43.	GFE Integration	6
P44.	Complete EMI/EMC Test	6

**GOES Q**

Milestone	Description	Completion Criteria
Q29.	Kickoff Meeting	1
Q30.	Deliver Launch Services Proposal	3

**GOES Q**

Q31.	Manufacturing Readiness Review	1
Q32.	Preliminary Design Review (If req'd)	1
Q33.	Transfer SEM instruments from precontractual stores	6
Q34.	Communication Subsystem to Integration	6
Q35.	T&C Subsystem to Integration	6
Q36.	Gate 11 - Antenna to Integration	5
Q37.	ACS Subsystem to Integration	6
Q38.	Gate 9 - Bus Complete	5
Q39.	Bus & SEM Instruments Integration & Test Complete	6
Q40.	S/C Unit Integration Complete	6
Q41.	SEM Instruments Integration & Test	6
Q42.	Gate 12 - S/C to System Test	5
Q43.	GFE Integration	6
Q44.	Complete EMI/EMC Test	6

<b>AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE N/A	PAGE OF 1   2
2. AMENDMENT/MODIFICATION NO. Fifty-eight (58)	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. See Block 12	5. PROJECT NO. (If applicable)
ISSUED BY NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		7. ADMINISTERED BY (If other than Item 6) NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)  Boeing Satellite Systems, Inc. PO Box 92919 Los Angeles, CA 90009			

CODE (X)	9A. AMENDMENT OF SOLICITATION NO.	FACILITY CODE 9B. DATED (SEE ITEM 11)
X	10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)  
BX B/NC: 427 N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	d. OTHER (Specify type of modification and authority) Basic Contract Authority

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification revises clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS and Attachment K Performance Based Payments Completion Criteria at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J.T. Felicita, Manager, NASA Contracts		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall	
15B. CONTRACTOR/OFFEROR <i>J.T. Felicita</i> (Signature of person authorized to sign)	15C. DATE SIGNED 11/08/01	16B. UNITED STATES OF AMERICA BY <i>Sandra Marshall</i> (Signature of Contracting Officer)	16C. DATE SIGNED 11/13/01

7540-01-152-8070

30-105

PREVIOUS EDITION UNUSABLE

STANDARD FORM 30 (Rev. 10-83)

Prescribed by GSA



**1. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, make the following changes:**

Add O43, Component and Subsystem Test Data Packages, \$3,000,000, 10/01/01.

Decrease O32, Bus & SEM Instruments Integration & Test Complete from \$13,000,000 to \$10,000,000.

**2. In Clause J.1 LIST OF ATTACHMENTS, make the following change:**

Attachment K, Performance Based Payments Completion Criteria

Add O43, Component and Subsystem Test Data Packages with a completion criteria of Document S-415-26, SFAT-3.3.1-02.

**3. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 18

Page 19

Attachment K

Title Page

Page 5

Page 6

END OF MODIFICATION

**SECTION B OF NAS5-98069  
MODIFICATION NO. 58  
SUPPLIES OR SERVICES AND PRICES/COSTS**

O22.	RESERVED		
O23.	RESERVED		
O24.	External Independent Readiness Review	\$1,000,000	2/12/04
O25.	Senior NASA Management Mission Readiness Review	\$500,000	3/10/04

O26.	Launch Readiness Review	\$500,000	3/31/04
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**System Events**

O27.	Spacecraft Engineering Handover	\$2,000,000	4/30/04
O28.	Final On-orbit Acceptance	\$1,000,000	9/24/04

**Contractor Defined Milestones**

O29.	Gate 7 - Start Bus Integration	\$1,900,000	2/11/00
O30.	Gate 9 - Bus Complete	\$1,000,000	8/24/00
O31.	Gate 10 - Payload Complete	\$1,000,000	1/16/01
O32.	Bus & SEM Instruments Integration & Test Complete	\$10,000,000	1/16/01
O33.	XRS/EUV/EPS/HEPAD Flight Unit #2 (N-O Spares) Pre-Shipment Review	\$1,500,000	12/07/01
O34.	Gate 12 – GOES O S/C to System Test	\$4,000,000	4/03/02
O35.	Gate 13 – GOES O S/C Complete	\$2,000,000	1/07/03
O36.	GOES-O End-to-End Test 4 Completed	\$2,000,000	12/05/02
O37.	Gate 7U.5 – GOES O Bus Propulsion Subsystem Complete	\$9,500,000	11/15/00
O38.	Gate 11 – GOES O Antenna to Integration	\$9,500,000	10/30/00
O39.	Gate 12A – Solar Wing to System Test	\$10,000,000	10/01/01

**SECTION B OF NAS5-98069  
MODIFICATION NO. 58  
SUPPLIES OR SERVICES AND PRICES/COSTS**

O40.	GOES O Bus Interface Verification Test	\$9,000,000	10/01/01
O41.	GOES O Yoke Electrical Testing	\$8,700,000	10/01/01
O42.	GOES O End-to-End Test 2 Completed	\$3,000,000	10/01/02
O43.	Component & Subsystem Test Data Packages	\$3,000,000	10/01/01

**GOES P**

**Spacecraft System Level Reviews**

P1.	Critical Design Review	\$3,750,000	2/6/04
P2.	Mission Operations Review	\$4,000,000	4/5/05
P3.	Pre-Environmental Review	\$4,000,000	7/5/05
P4.	Pre-Shipment Review	\$2,400,000	11/29/05
P5.	Flight Operations Review	\$2,400,000	1/12/06
P6.	Spacecraft Launch Readiness Review	\$2,300,000	4/4/06

**Software Subsystem Reviews**

P7.	Critical Design Review	\$7,000,000	11/4/03
P8.	Test Readiness Review	\$3,750,000	12/30/03
P9.	Acceptance Review	\$3,750,000	3/2/04

**Launch Services**

P10.	Launch Vehicle Interface Requirements Document	\$3,750,000	11/28/03
P11.	Spacecraft/Launch Vehicle Interface Control Document	\$4,000,000	1/5/05
P12.	Mission Integration Program Kickoff Review	\$7,000,000	10/8/03
P13.	Final Loads Verification Review	\$4,000,000	7/29/05

Attachment K

**PERFORMANCE BASED PAYMENTS**  
**COMPLETION CRITERIA**  
**(Contractor Provided Milestones)**

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January 12, 1998

(Revision A – September 10, 1998)

**GOES O**

O33.	XRS/EUV/EPS/HEPAD Flight Unit#2 (N-O Spares) Pre-Shipment Review	1
O34.	Gate 12 - GOES O S/C to System Test	5
O35.	Gate 13 - GOES O S/C Complete	5
O36.	GOES O End-to-End Test 4 Completed	6
O37.	Gate 7U.5 - GOES O Bus Propulsion Subsystem, Complete	5
O38.	Gate 11 - GOES O Antenna to Integration	5
O39.	Gate 12A - Solar Wing to System Test	5
O40.	GOES O Bus Interface Verification Test	6
O41.	GOES O Yoke Electrical Testing	6
O42.	GOES O End-to-End Test 2 Completed	6
O43.	<b>Component &amp; Subsystem Test Data Packages</b>	<b>Document S-415-26 SFAT- 3.3.1-02</b>

**GOES P**

Milestone	Description	Completion Criteria
P29.	Kickoff Meeting	1
P30.	Deliver Launch Services Proposal	3
P31.	Manufacturing Readiness Review	1
P32.	Preliminary Design Review (If req'd)	1
P33.	Transfer SEM instruments from precontractual stores	6
P34.	Communication Subsystem to Integration	6
P35.	T&C Subsystem to Integration	6
P36.	Gate 11 - Antenna to Integration	5
P37.	ACS Subsystem to Integration	6
P38.	Gate 9 - Bus Complete	5
P39.	Bus & SEM Instruments Integration & Test Complete	6
P40.	S/C Unit Integration Complete	6
P41.	SEM Instruments Integration & Test	6
P42.	Gate 12 - S/C to System Test	5
P43.	GFE Integration	6
P44.	Complete EMI/EMC Test	6

GOES Q

Milestone	Description	Completion Criteria
Q29.	Kickoff Meeting	1
Q30.	Deliver Launch Services Proposal	3
Q31.	Manufacturing Readiness Review	1
Q32.	Preliminary Design Review (If req'd)	1
Q33.	Transfer SEM instruments from precontractual stores	6
Q34.	Communication Subsystem to Integration	6
Q35.	T&C Subsystem to Integration	6
Q36.	Gate 11 - Antenna to Integration	5
Q37.	ACS Subsystem to Integration	6
Q38.	Gate 9 - Bus Complete	5
Q39.	Bus & SEM Instruments Integration & Test Complete	6
Q40.	S/C Unit Integration Complete	6
Q41.	SEM Instruments Integration & Test	6
Q42.	Gate 12 - S/C to System Test	5
Q43.	GFE Integration	6
Q44.	Complete EMI/EMC Test	6

AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT		1. CONTRACT ID CODE N/A	PAGE OF PAGES 1   13
2. AMENDMENT/MODIFICATION NO. Fifty-Nine (59)	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. See Block 12	5. PROJECT NO. (If applicable)
6. ISSUED BY CODE NASA/Goddard Space Flight Center GOES Procurement Office, Code 214.2 Greenbelt, MD 20071		7. ADMINISTERED BY (If other than Item 6) CODE NASA/Goddard Space Flight Center and DCMC/Hughes - Los Angeles	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE (X)	9A. AMENDMENT OF SOLICITATION NO.	FACILITY CODE 9B. DATED (SEE ITEM 11)
X	10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

## 12. ACCOUNTING AND APPROPRIATION DATA (If required)

PCN: 415-02739A(1C) JON: 415-616-41-81-11 BLI: A707 OC: 41-2550 APP: 801/20110(01) AMT: \$0 PPC: BX B/NC:

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: 52.243-1 Changes Fixed-Price - Alt. II
	d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Request (CCR) 6184B for GOES N/O Spares at an increase to the firm fixed price of \$49,500,000 and CCR's 4173, 4249A, 4281, 7025, 7050 and 8042A at no change to the fixed price.

## Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) J.T. Felicita, Manager, NASA Contracts	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Sandra Marshall
15B. CONTRACTOR/OFFEROR <i>J. T. Felicita</i> (Signature of person authorized to sign)	15C. DATE SIGNED 12/7/01
16B. UNITED STATES OF AMERICA BY <i>Sandra Marshall</i> (Signature of Contracting Officer)	16C. DATE SIGNED 12/10/01

1. In Clause B.1 DELIVERABLE REQUIREMENTS add Contract Line Item number 11a. as follows:

<u>CLIN</u>	<u>Description</u>	<u>Price</u>
11a.	One set of GOES N/O Spares as listed in Attachment M	\$49,500,000

2. Increase Clause B.2 FIRM FIXED PRICE as follows:

<u>From</u>	<u>By</u>	<u>To</u>
\$461,960,104	\$49,500,000	\$511,460,104

3. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, add the following events for GOES O:

OS1.	GOES O Spares Kick-Off Meeting	\$13,000,000	11/05/01
OS2.	Place Order to Panametrics – SEM Instruments	\$3,000,000	12/01/01
OS3.	Place Order for COMDEV Microwave Units	\$3,100,000	01/15/02
OS4.	Place Order for SAAB Deployable Omni Antenna	\$3,400,000	02/15/02
OS5.	Place Order for Ball Star Trackers	\$3,500,000	03/15/02
OS6.	Order Solar Cells & Yoke	\$3,300,000	04/01/02
OS7.	Order Structure Long Lead Parts	\$2,500,000	05/01/02
OS8.	Order LHPs	\$2,400,000	06/01/02
OS9.	Order CCHPs	\$2,400,000	07/01/02
OS10.	Receive Yoke Substrate	\$1,100,000	08/01/02
OS11.	EP Power Components Complete	\$1,100,000	08/01/02
OS12.	Structure Composites Fab Complete	\$1,100,000	09/01/02
OS13.	Magnetometer Delivery Complete	\$1,100,000	09/15/02
OS14.	Harness Fab Complete	\$1,100,000	10/01/02
OS15.	Aft T&C Omni Complete	\$1,100,000	10/30/02
OS16.	Battery Fabrication Complete	\$2,100,000	11/01/02
OS17.	Receive Solar Cells	\$1,100,000	12/01/02
OS18.	Spacecraft Structure Assembly Complete	\$1,100,000	12/01/02
OS19.	Panametrics Delivery Complete	\$1,100,000	01/01/03
OS20.	Gate 11 – Antenna to Integration	\$900,000	01/15/03



4. In Clause E.1 MATERIAL INSPECTION AND RECEIVING REPORT NOT REQUIRED, add CLIN 11a. as an item that requires a Material Inspection and Receiving Report at the time of delivery.

5. In Clause F.1 DELIVERY SCHEDULE, add the following:

Contract Line Item Number <u>(CLIN)</u>	<u>Description</u>	<u>Delivery Date</u>	<u>SOW Reference</u>
11a.	One Set of GOES N/O Spares as listed in Attachment M	April 2004	3.3.17

6. In Clause F.2 ENGINEERING HANDOVER DATES AND STORAGE DATES, change the earliest storage date for GOES P to January 1, 2005 and change the engineering handover date for GOES P to April 30, 2005.

7. Modify Clause H.1 OPTION FOR ADDITIONAL SPACECRAFT, to reflect the underlined text:

The Contracting Officer shall give the Contractor at least 24 months written notice prior to the GOES P engineering handover date and 36 months written notice, prior to the GOES Q engineering handover date, that the Government intends to unilaterally exercise, by contract modification, the option for one additional GOES spacecraft. The Government reserves the right to unilaterally exercise this option earlier and accelerate the engineering handover date providing the Contractor receives written notice 36 months prior to the accelerated engineering handover date. These options shall be exercised sequentially.

Refer to Clauses H.2, H.22 and H.24 for other changes to the above-mentioned prices.

8. In Clause H.4 ADDITIONAL GOVERNMENT ACCOMMODATIONS, modify the first paragraph in item b. to reflect the underlined text:

b. For reasons other than the condition stated in paragraph a. above, the Government may delay the spacecraft test program by no more than thirty (30) days, twenty-eight (28) days for GOES N only, for late instrument deliveries or additional instrument

accommodations. If this delay exceeds thirty (30) days, twenty-eighty (28) days for GOES N only, the Government shall adjust the engineering handover date, for that spacecraft, on a day-for-day basis. The Government shall also pay to the contractor, for each spacecraft or replacement spacecraft, the daily rate below for the specified instrument.

In the event that the SXI flight instrument is delivered to the contractor in time to integrate it to the yoke prior to the GOES N Yoke Electrical Tests without delay to those tests, the contractor shall not be required to integrate the SXI engineering model and shall proceed directly to SXI flight instrument integration. In that case, the allowable Government delay of spacecraft test reverts back to thirty (30) days for GOES N.

**9. Modify the following paragraphs in Clause H.10 ELECTION OF GOVERNMENT-PROVIDED LAUNCH SERVICES AND ADVANCE AGREEMENT FOR DEDUCTIVE CHANGE FOR GOVERNMENT-PROVIDED LAUNCH SERVICES to reflect the underlined text:**

The Government may elect to provide launch services to the contractor for any spacecraft or its replacement, in lieu of contractor-provided launch services. The Government may invoke this deductive change through a unilateral modification to the contract, provided the Government has issued this modification at least 29 months prior to the engineering handover date for GOES N, 32 months prior to the engineering handover date for GOES O, 24 months prior to the engineering handover date for GOES P and 25 months prior to the engineering handover date for GOES Q. The respective contract line item in Clause B.1, contract price in Clause B.2, Performance Based Payments in Clause B.4 and option price in Clause H.1 shall each be reduced by the following amount:

If a unilateral modification electing Government-provided launch services is issued less than 29 months prior to the engineering handover date for GOES N, 32 months prior to the engineering handover date for GOES O, 24 months prior to the engineering handover date for GOES P and 25 months prior to the scheduled engineering handover date for GOES Q, the unilateral modification shall constitute a partial termination and shall be executed per the Advance Understanding in Clause H.11. The date of issuance shall be the effective date of the unilateral modification indicating election of Government-provided launch services.

**10. Add Clause H.24 ADVANCE AGREEMENT FOR USING SPARE PARTS ON ADDITIONAL SPACECRAFT**

When NASA exercises Option 1 for GOES P under Clause H.1 OPTION FOR ADDITIONAL SPACECRAFT, NASA may unilaterally authorize the contractor to utilize item number 11a., GOES N/O Spares, in Clause B.1 DELIVERABLE

REQUIREMENTS for this spacecraft. If this authorization is given, the firm fixed price of Option 1 shall be reduced by \$49,500,000. Once this reduction has been made, performance based payments for GOES P will be replaced with the list of events in Attachment N of this contract.

Further, if this authorization is given, the delivery of the GOES N/O Spares shall be delayed and the contractor shall retain title, possession, and risk of damage or loss of the GOES N/O spares until the final acceptance by the Government of the GOES P spacecraft. At such time as the Contractor shall tender the GOES P spacecraft for final delivery and acceptance by the Government, the contractor shall include in the document of delivery (DD-250), by separate line item, the tender of the basic contract item 11a. (GOES N/O Spares) for delivery and acceptance. The Government agrees that the delivery and acceptance of the GOES P spacecraft shall be sufficient to meet the criteria for the acceptance of basic contract item 11a. (GOES N/O Spares).

If NASA does not exercise Option 1, the contractor shall be entitled to an equitable adjustment for the costs associated with delivery and Government acceptance procedures of Contract Line Item Number 11a.

All other terms and conditions of the contract remain in effect for these options.

(End of clause)

**11. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

**Attachment A, Statement of Work**

Add the following paragraph:

**3.3.17 GOES N, O Spacecraft Spares**

The spacecraft contractor shall furnish all necessary personnel, facilities, services, and materials to support the fabrication, the assembly, and the test efforts for one full set of flight qualified GOES NO spares (except the optical bench and the thermal blankets). The spacecraft contractor personnel, facilities, service, and upkeep efforts, for the development of the spares, shall comply with the ground storage, the on orbit storage, and the on orbit operation lifetime mission requirements of the spacecraft. All subsystems and component testing shall be performed with calibrated GSE. All the spacecraft contractor practices, testing, and support as detailed by the Subsystem Fabrication, Assembly, and Test (Section 3.3 and subsections) shall be utilized. In the

event that any of the GOES spare unit(s) is needed to replace a GOES N and/or GOES O flight unit, the spacecraft contractor shall replace the spare unit.

Add the underlined text to the end of the following paragraph:

**3.4.3.5.1 Flight Instrument Integration (GOES-N only)**

In addition to the times allocated in other sections of this SOW, for GOES-N only, allocate 19 days each (38 total) for the Imager and Sounder contractor to perform systems tests and electrical interface tests of the flight instruments to be performed in conjunction with safe-to-mate tests.

For GOES-N only, the spacecraft contractor shall de-integrate the SXI engineering model and retrofit an SXI flight instrument onto the GOES N yoke mounting panel prior to the following GOES N spacecraft tests: EMI/EMC, Stray Magnetic Fields, RF Airlink, Acoustic, Sine Vibration, Pyroshock, ETE Test #2, and Spacecraft Thermal Vacuum. The integration and test activities for the SXI flight instrument shall be conducted in accordance with paragraph 3.4. In the event that the SXI flight instrument is delivered to the contractor in time to integrate it to the yoke prior to the GOES N Yoke Electrical Tests without delay to those tests, the contractor shall not be required to integrate the SXI engineering model, and shall proceed directly to SXI flight instrument integration.

Add the following paragraph:

**3.3.13.1 Emulator Warranty**

The spacecraft contractor shall provide continuous hardware and software maintenance (i.e parts and labor) support for all delivered spacecraft emulators and spacecraft contractor provided spare emulator boards (e.g. ETC, EACE) from the time of Final Acceptance by the government until October 7, 2003. The spacecraft contractor shall also maintain the Imager/Sounder Instrument simulator hardware for this same period. SXI Emulator hardware and software and Imager/ Sounder Instrument simulator software maintenance remains the responsibility of the government.

During the period from Final Acceptance to October 7, 2003, the spacecraft contractor shall update the spacecraft emulator hardware and software with any changes associated with changes to the flight ACE hardware or software. Additionally, the spacecraft contractor shall support up to seven (7) simulation software upgrades to support GIR closure or database modifications.

Any problems or discrepancies encountered by the government during the maintenance period will be reported as GIRs and maintained in the NOAA ATS. GIRs identifying emulator non-conformity to Performance Specification requirements or failures in either

emulator hardware or software, and are deemed necessary by the NASA/NOAA Ground System Review Board shall be fixed by the spacecraft contractor maintenance team during this period. The spacecraft contractor shall provide an emulator representative to participate on the NASA/NOAA Ground System Review Board. Teleconference participation in review board meetings by this representative is acceptable.

Add the following to the end of paragraph 3.4.4:

Government and GFE contractor support for activities involving GFE instruments is defined in Table 3.4.5.1.

Add the following paragraph:

**3.4.4.4.4 DCPR 8 PSK End-to-End BER Demonstration Test**

The spacecraft contractor shall perform a one-time end-to-end BER test on the GOES N or O spacecraft to verify the compatibility of a GFE 8 PSK modem pair (uplink and downlink) with one of the GOES N-Q spacecraft. The spacecraft contractor BER STE in combination with the GFE modem pair shall comprise the required test set. The spacecraft contractor BER STE shall consist of all the required frequency conversion, noise level set, and bit stream transmitters and receivers. The combined test equipment shall be used to measure BER as a function of Eb/No for the service downlinks. The Government will ensure that the GFE modem interconnects with the spacecraft contractor BER STE without modification of the spacecraft contractor STE. Three configurations shall be used in the test. In the first configuration, the STE including the GFE modem pair shall be connected together by a simple loopback to establish a baseline for the other measurements. The second configuration characterizes the combined response of the DCPI satellite channel, GFE modems, and the spacecraft contractor BER STE *without* adjacent channel interference. The third configuration characterizes the combined response of the DCPR satellite channel, GFE modems, spacecraft contractor BER STE with interference from adjacent operating satellite channels.

Data for each curve shall be collected using the 8PSK waveform running at 1.2 kbps. For each curve, six (6) data points will be collected and the last point will be at an error rate of approximately  $10^{-6}$ . The test shall use only the primary receiver and only the domestic band.

In support of the test, the spacecraft contractor shall develop and release via Special Test Request (STR) a test plan and test procedure. The plan and procedure shall be provided to the government for review. Prior to the test, the spacecraft contractor shall hold a test readiness review. Following the completion of the test, the spacecraft contractor shall issue a test report, which summarizes the findings of the test.

Testing for the three test configurations shall be allocated 7 days/3 shifts. The allocated time for this test includes pre-test setup, test execution, and post-test deconfiguration. Debug activities shall be limited to those necessary to establish valid test configurations and resolve test execution deficiencies. Anomalies encountered during the testing shall be tracked by the spacecraft contractor's test anomaly tracking system. The DCPR 8PSK BER Demonstration Test shall be performed no later than GOES N PSR minus 2 months. The test shall be scheduled by the spacecraft contractor to minimize the schedule disruption and will use spacecraft flight hardware to the maximum extent possible.

Modify paragraph 3.4.5.1 to include the underlined text as follows:

#### **3.4.5.1 GOES N-Q Environmental Tests with GFE Instruments**

The spacecraft contractor shall schedule the following work days per GFE instrument (i.e., multiply by 3 for the Imager, Sounder, and SXI) for instrument testing during spacecraft environmental testing. GFE Instrument test durations defined in Table 3.4.5.1 assume a 24-hour work day during thermal vacuum testing, and a 16-hour work day for other phases. Government and GFE contractor support during activities involving GFE instruments is defined in Table 3.4.5.1. Durations may be adjusted to accommodate the spacecraft nominal work day as long as the total number of test hours remains constant. The spacecraft contractor shall provide access to the spacecraft, spacecraft GSE, and personnel as required to support the testing. Spacecraft testing may be conducted in parallel if it does not interfere with or compromise instrument testing. The spacecraft contractor shall allow GFE instrument tests to be conducted in parallel with spacecraft testing if they do not interfere with or compromise spacecraft testing. The spacecraft contractor shall keep the GFE instruments on and operating during temperature transitions at all times possible.

Table 3.4.5.1  
GFE Instrument Test Program Requirements

Test Phase	Days Per Instrument**	Additional Requirements
Baseline Performance	10 (30 total)	As defined in section 3.4.4.2
Pre-Vibration Functional	0.5 (1.5 total)	
Post-Vibration Ambient	1 (3 total)	Imager/Sounder cooler door axis vertical
TV Eqpt. Install/checkout/align	3 total	Instrument manufacturing preparations for T/V conducted in parallel
Pre-TV (ambient in chamber)	2 (6 total)	Perform dynamic interaction test
High Temp. Outgassing	8 total*	Note: 7 days outgassing + 1 day for cooler cool down
TV "Hot" Plateau	4 (12 total)	Perform dynamic interaction test. Limit activities which disturb instrument temperature stability.
Mission Ops ETE Test #3	1.33 (32 hrs)	As defined in section 3.6.2.3.2.3
TV "Cold" Plateau	4 (12 total)	Limit activities which disturb instrument temperature stability. Perform dynamic interaction test
Post-TV (ambient in chamber)	2 (6 total)	
Post-TV/Pre-Ship Functional	8 (24 total)	Imager/Sounder cooler door axis vertical, Perform wide field collimator test
Preparation for shipment	2 total	
Launch Base Functional	5 (15 total)	As defined in section 3.4.6.1

\* 7 day outgassing is the nominal duration. Outgassing shall continue until TQCM and RGA measurements satisfy the contamination requirements of S-415-22, section 10.11.

\*\* During SCTV phases, the government and GFE contractors shall support 24 hour work days, 7 days a week as required for activities involving GFE instruments. During non-SCTV phases, the government and GFE contractors shall support 16-hour work days as required for activities involving the GFE instruments, except for GOES N and O where the government and GFE Imager/Sounder contractor shall support up to 52 (GOES N) and 44 (GOES O) 24-hour work days 6 days a week as required for activities involving the GFE instruments.

Attachment B, Performance Specification

Modify paragraph 9.2.2.1 to reflect the underlined text as follows:

9.2.2.1 *Envelope & Mass* - The spacecraft and launch vehicle design shall accommodate an Imager sensor module, electronics module, and power supply of the mass and dimensions defined in the Imager ICD. The spacecraft shall include margin for a growth in the total mass of the GOES-N Imager up to 313 lb (142.0 Kg) and of the GOES O, P, and Q Imagers to 316 lb (143.3 Kg.).

Modify paragraph 9.3.2.1 to reflect the underlined text as follows:

9.3.2.1 *Envelope and Mass* - The spacecraft and launch vehicle design shall accommodate a Sounder sensor module, electronics module, and power supply of the mass and dimensions defined in the Sounder ICD. The spacecraft shall include margin for a growth in the total mass of the Sounder up to 339 lb (154.1 Kg.).

Attachment C, GOES N-Q Imager Interface Control Document

In table 3.2.1-1, correct the mass properties to reflect those in CCR 7025.

Modify paragraph 2.2 and 5.5 to incorporate the shimming requirements reflected in CCR 7050.

Attachment D, GOES N-Q Sounder Instrument Interface Control Document

In table 3.2.1-1, correct the mass properties to reflect those in CCR 7025.

Modify paragraph 2.2 and 5.5 to incorporate the shimming requirements reflected in CCR 7050.

Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

Modify paragraph SXI3.2.1-1, SXI3.2.1-2, delete paragraph SXI3.2.1-3, SXI3.2.1-4 and add table 3.2.1-1 to reflect the revised weight allocations reflected in CCR 4249A.

Modify paragraph 2.2.2 and 3.2.3 to reflect the center of gravity and moments of inertia changes reflected in CCR 8042A.



Attachment H, List of Government Furnished Property

Change the dates for the Imager, Sounder and SXI instruments to the following:

S/N10 Imager	August 2003
S/N10 Sounder	August 2003

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SXI - N	No earlier than October 15, 2001 No later than the start of GOES N EMI/EMC spacecraft level test minus four weeks
SXI - P	October 2003

Add the following:

<u>Item</u>	<u>Date Available</u>	<u>SOW Location</u>
DCPR Uplink, Downlink Modems & Interconnect Hardware	Oct. 1, 2001	3.4.4.4

Attachment J, Small, Small Disadvantaged and Women-Owned Small Business  
Subcontracting Plan

Add revision number two to reflect new numbers based on this negotiation. These numbers are reflected in the revised pages.

Attachment K, Performance Based Payments Completion Criteria, Contractor Provided  
Milestones

Add the following events:

<u>Milestone</u>	<u>Description</u>	<u>Completion Criteria</u>
OS1.	GOES O Spares Kick-Off Meeting	1
OS2.	Place Order to Panametrics - SEM Instruments	2
OS3.	Place Order for COMDEV Microwave Units	2
OS4.	Place Order for SAAB Deployable Omni Antenna	2
OS5.	Place Order for Ball Star Trackers	2
OS6.	Order Solar Cells & Yoke	2
OS7.	Order Structure Long Lead Parts	2
OS8.	Order LHPs	2
OS9.	Order CCHPs	2
OS10.	Receive Yoke Substrate	6
OS11.	EP Power Components Complete	6

OS12.	Structure Composites Fab Complete	6
OS13.	Magnetometer Delivery Complete	6
OS14.	Harness Fab Complete	6
OS15.	Aft T&C Omni Complete	6
OS16.	Battery Fabrication Complete	6
OS17.	Receive Solar Cells	6
OS18.	Spacecraft Structure Assembly Complete	6
OS19.	Panametrics Delivery Complete	6
OS20.	Gate 11 – Antenna to Integration	5

Add Attachment M, GOES N/O Spares, dated October 2001.

Add Attachment N, Performance Based Payments for Clause H.24, dated October 2001.

**12. Replace the contract areas listed below with the enclosed revised pages:**

Contract

Page 3  
Page 5  
Page 6  
Page 19  
Page 19a  
Page 34  
Page 39  
Page 40  
Page 43-45  
Page 52  
Page 53  
Page 62  
Page 76

Attachment A, Statement of Work

Section 3.3.13.1  
Section 3.3.17  
Section 3.4.3.5.1  
Section 3.4.4  
Section 3.4.4.4.4  
Section 3.4.5.1

Attachment B, Performance Specification

Section 9.2.2.1

Section 9.3.2.1

Attachment H, List of Government Furnished Property

Replace in its entirety dated October 2001

Attachment J, Small, Small Disadvantaged and Women-Owned Small Business  
Subcontracting Plan

Incorporate revision dated October 23, 2001

Attachment K, Performance Based Payments Completion Criteria

Title Page

Page 5-6

Attachment M, GOES N/O Spares

Title Page

Pages 1-4

Attachment N, GOES P Performance Based Payments for Clause H.24

New document

In consideration of the modification(s) agreed to herein as a complete equitable adjustment for the effort associated with the CCR's listed in Block 14 of page 1 of this modification and Boeing's proposal entitled GOES O Spares, dated September 2001, the Contractor hereby releases the Government from any and all liability under this contract for further equitable adjustments attributable to such facts or circumstances giving rise by this action.

END OF MODIFICATION

**INDEX OF CLAUSES FOR NAS5-98069  
MODIFICATION NO. 59**

**SECTION H**

- H.1 OPTION FOR ADDITIONAL SPACECRAFT
- H.2 LAUNCH SERVICES
- H.3 PRE-DETERMINED ADJUSTMENT FOR LATE DELIVERY
- H.4 ADDITIONAL GOVERNMENT ACCOMMODATIONS
- H.5 SUBCONTRACTING PLAN AND REPORTS FOR SMALL, SMALL  
DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS CONCERNS  
(GSFC 52.219-90) (JULY 1996)
- H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR  
1989)
- H.7 CONTRACTOR ASSISTANCE
- H.8 INCENTIVE SUBCONTRACTING PROGRAM
- H.9 SECTION H CLAUSES INCORPORATED BY REFERENCE
- H.10 ELECTION OF GOVERNMENT-PROVIDED LAUNCH SERVICES AND ADVANCE  
AGREEMENT FOR DEDUCTIVE CHANGE FOR GOVERNMENT PROVIDED  
LAUNCH SERVICES
- H.11 ADVANCE UNDERSTANDING REGARDING SETTLEMENT OF TERMINATION  
OF CONTRACTOR PROVIDED LAUNCH SERVICES
- H.12 LICENSES AND PERMITS FOR A LAUNCH SERVICE OPERATOR
- H.13 INSIGHT AND GOVERNMENT APPROVAL
- H.14 GOES N REPLACEMENT FOR FIRST YEAR SERVICE FAILURES
- H.15 NO COST TECHNICAL TRADES
- H.16 ADDITIONAL ADJUSTMENTS FOR LATE DELIVERIES
- H.17 RESERVED
- H.18 REVISED DATE FOR LATE INSTRUMENTS
- H.19 ONE TIME SLIP FOR GOES O
- H.20 ADJUSTED GROUND STORAGE RATE FOR GOES N AND O
- H.21 SPECIAL PERFORMANCE REQUIREMENTS
- H.22 ADVANCE AGREEMENT FOR CHANGES TO ADDITIONAL SPACECRAFT
- H.23 ADVANCE AGREEMENT FOR LAUNCH SERVICES ESCALATION COSTS
- H.24 ADVANCE AGREEMENT FOR USING SPARE PARTS ON ADDITIONAL  
SPACECRAFT

**SECTION I**

- I.1 LIST OF SECTION I CLAUSES INCORPORATED BY REFERENCE
- I.2 APPROVAL OF CONTRACT (52.204-1) (DEC 1989)
- I.3 RIGHTS TO PROPOSAL DATA (52.227-23) (TECHNICAL) (JUN 1987)
- I.4 SUBCONTRACTS (FIXED-PRICE CONTRACTS) (52.244-1) (FEB 1995)
- I.5 CLAUSES INCORPORATED BY REFERENCE (52.252-2) (JUN 1988)
- I.6 RIGHTS IN DATA--GENERAL (52.227-14) (JUN 1987) as modified by NASA FAR  
Supplement 18-52.227-14--ALTERNATE II (JUN 1987)

**SECTION J**

- J.1 LIST OF ATTACHMENTS (GSFC 52.210-101) (OCT 1988)

**SECTION B OF NAS5-98069  
MODIFICATION NO. 59  
SUPPLIES OR SERVICES AND PRICES/COSTS**

11.	On-Orbit Acceptance of GOES O Spacecraft	\$148,981,565
11a.	One set of GOES N/O Spares as listed in Attachment M	\$49,500,000
12.	Special Task Assignments with Reports	See Clause B.9

13.	Additional Integration & Testing Support	See Clause H.4
14.	Spacecraft Storage	See Clause H.4

**OPTION 1**

15.	On-Orbit Acceptance of GOES P Spacecraft	\$190,900,000
16.	Special Task Assignments with Reports	See Clause B.9
17.	Additional Integration & Testing Support	See Clause H.4
18.	Spacecraft Storage	See Clause H.4

**OPTION 2**

19.	On-Orbit Acceptance of GOES Q Spacecraft	\$185,000,000
20.	Special Task Assignments with Reports	See Clause B.9
21.	Additional Integration & Testing Support	See Clause H.4
22.	Spacecraft Storage	See Clause H.4

Total value of each CLIN, for purposes of final payment shall be reduced by Performance Based Payments made to the contractor for that CLIN.

(End of clause)

**SECTION B OF NAS5-98069  
MODIFICATION NO. 59  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.2 FIRM FIXED PRICE (18-52.216-78) (DEC 1988)**

The total firm fixed price for this contract is \$511,460,104.

(End of clause)

**B.3 RESERVED**

**B.4 PERFORMANCE-BASED PAYMENTS (52.232-32) (MAY 1997)**

(a) Amount of payments and limitations on payments. Subject to such other limitations and conditions as are specified in this contract and this clause, the amount of payments and limitations on payments shall be specified in the contract's description of the basis for payment.

(b) Contractor request for performance-based payment. The Contractor may submit requests for payment of performance-based payments not more frequently than monthly, in a form and manner acceptable to the Contracting Officer. Unless otherwise authorized by the Contracting Officer, all performance-based payments in any period for which payment is being requested shall be included in a single request, appropriately itemized and totaled. The Contractor's request shall contain the information and certification detailed in paragraphs (l) and (m) of this clause.

(c) Approval and payment of requests. (1) The Contractor shall not be entitled to payment of a request for performance-based payment prior to successful accomplishment of the event or performance criterion for which payment is requested. The Contracting Officer shall determine whether the event or performance criterion for which payment is requested has been successfully accomplished in accordance with the terms of the contract. The Contracting Officer may, at any time, require the Contractor to substantiate the successful performance of any event or performance criterion which has been or is represented as being payable.

(2) A payment under this performance-based payment clause is a contract financing payment under the Prompt Payment clause of this contract, and approved requests shall be paid in accordance with the prompt payment period and provisions specified for contract financing payments by that clause. However, if the Contracting Officer requires substantiation as provided in paragraph (c)(1) of this clause, or inquires into the status of an event or performance criterion, or into any of the conditions listed in paragraph (e) of this clause, or into the Contractor certification, payment is not required, and the prompt payment period shall not begin until the Contracting Officer approves the request.

(3) The approval by the Contracting Officer of a request for performance-based payment does not constitute an acceptance by the Government and does not excuse the Contractor from

**SECTION B OF NAS5-98069  
MODIFICATION NO. 59  
SUPPLIES OR SERVICES AND PRICES/COSTS**

O40.	GOES O Bus Interface Verification Test	\$9,000,000	10/01/01
O41.	GOES O Yoke Electrical Testing	\$8,700,000	10/01/01
O42.	GOES O End-to-End Test 2 Completed	\$3,000,000	10/01/02
O43.	Component & Subsystem Test Data Packages	\$3,000,000	10/01/01

**Spares**

OS1.	GOES O Spares Kick-Off Meeting	\$13,000,000	11/05/01
OS2.	Place Order to Panametrics – SEM Instruments	\$3,000,000	12/01/01
OS3.	Place Order for COMDEV Microwave Units	\$3,100,000	01/15/02
OS4.	Place Order for SAAB Deployable Omni Antenna	\$3,400,000	02/15/02
OS5.	Place Order for Ball Star Trackers	\$3,500,000	03/15/02
OS6.	Order Solar Cells & Yoke	\$3,300,000	04/01/02
OS7.	Order Structure Long Lead Parts	\$2,500,000	05/01/02
OS8.	Order LHPs	\$2,400,000	06/01/02
OS9.	Order CCHPs	\$2,400,000	07/01/02
OS10.	Receive Yoke Substrate	\$1,100,000	08/01/02
OS11.	EP Power Components Complete	\$1,100,000	08/01/02
OS12.	Structure Composites Fab Complete	\$1,100,000	09/01/02
OS13.	Magnetometer Delivery Complete	\$1,100,000	09/15/02
OS14.	Harness Fab Complete	\$1,100,000	10/01/02
OS15.	Aft T&C Omni Complete	\$1,100,000	10/30/02
OS16.	Battery Fabrication Complete	\$2,100,000	11/01/02

**SECTION B OF NAS5-98069  
MODIFICATION NO. 59  
SUPPLIES OR SERVICES AND PRICES/COSTS**

OS17.	Receive Solar Cells	\$1,100,000	12/01/02
OS18.	Spacecraft Structure Assembly Complete	\$1,100,000	12/01/02
OS19.	Panametrics Delivery Complete	\$1,100,000	01/01/03
OS20.	Gate 11 - Antenna to Integration	\$900,000	01/15/03

**GOES P**

**Spacecraft System Level Reviews**

P1.	Critical Design Review	\$3,750,000	2/6/04
P2.	Mission Operations Review	\$4,000,000	4/5/05
P3.	Pre-Environmental Review	\$4,000,000	7/5/05
P4.	Pre-Shipment Review	\$2,400,000	11/29/05
P5.	Flight Operations Review	\$2,400,000	1/12/06
P6.	Spacecraft Launch Readiness Review	\$2,300,000	4/4/06

**Software Subsystem Reviews**

P7.	Critical Design Review	\$7,000,000	11/4/03
P8.	Test Readiness Review	\$3,750,000	12/30/03
P9.	Acceptance Review	\$3,750,000	3/2/04

**Launch Services**

P10.	Launch Vehicle Interface Requirements Document	\$3,750,000	11/28/03
P11.	Spacecraft/Launch Vehicle Interface Control Document	\$4,000,000	1/5/05
P12.	Mission Integration Program Kickoff Review	\$7,000,000	10/8/03
P13.	Final Loads Verification Review	\$4,000,000	7/29/05



**SECTION E OF NAS5-98069  
MODIFICATION NO. 59  
INSPECTION AND ACCEPTANCE**

**E.1 MATERIAL INSPECTION AND RECEIVING REPORT NOT REQUIRED  
(GSFC 52.246-94) (APR 1989)**

NASA FAR Supplement clause 18-52.246-72 of this contract requires the furnishing of a Material Inspection and Receiving Report (MIRR) (DD Form 250 series) at the time of delivery of CLIN's 1-11a., 15, and 19 under this contract. All remaining CLINs do not require a MIRR.

(End of clause)

**E.2 RESERVED**

**E.3 INSPECTION SYSTEM RECORDS (GSFC 52.246-102) (OCT 1988)**

The Contractor shall maintain records evidencing inspections in accordance with the Inspection clause of this contract for one (1) year after contract completion.

(End of clause)

**E.4 MATERIAL INSPECTION AND RECEIVING REPORT (18-52.246-72) (JUN 1995)**

(a) At the time of each delivery to the Government under this contract, the Contractor shall furnish a Material Inspection and Receiving Report (DD Form 250 series) prepared in an original copy and sufficient other copies to accomplish the following distribution:

(1) Via mail and marked "Advance Copy", one copy each to the Contracting Officer, the Contracting Officer's Technical Representative (if designated in the contract), and to the cognizant Administrative Contracting Officer, if any.

(2) Via mail, the original and 1 copy (unfolded) to the shipment address (delivery point) specified in Section F of this contract. Mark the exterior of the envelope "CONTAINS DD FORM 250". This must arrive prior to the shipment.

(3) With shipment in waterproof envelope (one copy) for the consignee.

(4) If the shipment address is not directly to the Goddard Space Flight Center (Greenbelt)

**SECTION F OF NAS5-98069  
MODIFICATION NO. 59  
DELIVERIES OR PERFORMANCE**

9.	Data for Communication Modeling	3.2.8.1
	Engineering Model Data	PDR+3 mos. 3.3.8.1
	Flight Model Data	CDR+6 mos.
10.	Acceptance of SSGS	GOES N L+9 mos. 3.5.2.1 Spec. 7.0
11.	On-Orbit Acceptance of GOES O Spacecraft	End of GOES O PLT 3.6.4
11a.	One set of GOES N/O Spares as listed in Attachment M	April 2004 3.3.17
12.	Special Task Assignments with Reports	See Clause B.9
13.	Additional Integration & Testing Support	See Clause H.4
14.	Spacecraft Storage	See Clause H.4

**OPTION 1**

15.	On-Orbit Acceptance of GOES P Spacecraft	End of GOES P PLT 3.6.4
16.	Special Task Assignments with Reports	See Clause B.9
17.	Additional Integration & Testing Support	See Clause H.4
18.	Spacecraft Storage	See Clause H.4

**OPTION 2**

19.	On-Orbit Acceptance of GOES Q Spacecraft	End of GOES Q PLT 3.6.4
20.	Special Task Assignments with Reports	See Clause B.9

**SECTION F OF NAS5-98069  
MODIFICATION NO. 59  
DELIVERIES OR PERFORMANCE**

- |     |   |                |
|-----|---|----------------|
| 21. | Additional Integration &<br>Testing Support | See Clause H.4 |
| 22. | Spacecraft Storage                          | See Clause H.4 |

Solely for purposes of mailing DD Form 250, the shipment address shall be to the Contracting Officer, Mail Code 214.2, NASA/GSFC, Greenbelt, MD 20771.

(End of clause)

**F.2 ENGINEERING HANDOVER DATES AND STORAGE DATES**

The following dates are defined as the engineering handover dates and the earliest dates at which the spacecraft may be placed into ground storage as defined in Clause H.4:

	<u>Earliest Ground Storage Date</u>	<u>Engineering Handover Date</u>
GOES N	January 1, 2002	January 31, 2003
GOES O	January 1, 2003	April 30, 2004
GOES P	January 1, 2005	April 30, 2005
GOES Q	January 1, 2008	April 30, 2008

The contractor shall place the GOES N and O spacecraft into storage at the contractor's facility immediately following successful completion of spacecraft Integration and Test (I&T), but no earlier than the dates specified for Earliest Storage Date (ESD). No storage charges, as defined in Clause H.4, shall be paid prior to the ESD.

(End of clause)

**F.3 SECTION F CLAUSES INCORPORATED BY REFERENCE**

- (52.242-15) STOP-WORK ORDER (AUG 1989)  
(52.247-34) F.Q.B. DESTINATION (NOV 1991)

(End of By Reference Section)

**SECTION H OF NAS5-98069  
MODIFICATION NO. 59  
SPECIAL CONTRACT REQUIREMENTS**

**H.1 OPTION FOR ADDITIONAL SPACECRAFT**

The Government reserves the right to unilaterally order additional missions as specified in Clause B.1 DELIVERABLE REQUIREMENTS and Clause F.1 DELIVERY SCHEDULE.

The total price for Option 1, GOES P is \$190,900,000.

The total price for Option 2, GOES Q is \$185,000,000.

The Contracting Officer shall give the Contractor at least 24 months written notice, prior to the GOES P engineering handover date and 36 months written notice, prior to the GOES Q engineering handover date, that the Government intends to unilaterally exercise, by contract modification, the option for one additional GOES spacecraft. The Government reserves the right to unilaterally exercise this option earlier and accelerate the engineering handover date providing the Contractor receives written notice 36 months prior to the accelerated engineering handover date. These options shall be exercised sequentially.

Refer to Clauses H.2, H.22 and H.24 for other changes to the above-mentioned prices.

All other terms and conditions of the contract remain in effect for these options.

(End of Clause)

**H.2 LAUNCH SERVICES**

The Contractor shall use a Delta III vehicle for launch of GOES N.

The Contractor shall use a Delta III vehicle for launch of GOES O.

The Contractor shall use a TBP (when option is exercised) vehicle for launch of GOES P.

The Contractor shall use a TBP (when option is exercised) vehicle for launch of GOES Q.

Once the Government has exercised the option for the additional P or Q spacecraft, the Contractor shall re-determine the price of the launch services for each option. The Contractor shall submit a proposal, for the price of the launch services only, within 45 days. At this time the price of the option spacecraft, as stated in Clause B.1 and H.1, shall be reduced by \$130 million for GOES P and \$140 million for GOES Q and increased by the amount negotiated after receipt of this proposal.

All other terms and conditions remain the same.

(End of clause)

**SECTION H OF NAS5-98069  
MODIFICATION NO. 59  
SPECIAL CONTRACT REQUIREMENTS**

**H.3 PRE-DETERMINED ADJUSTMENT FOR LATE DELIVERY**

(a) If the engineering handover date, as defined in the contract schedule, is delayed by more than one hundred twenty (120) days for GOES N, more than ninety (90) days for GOES O or more than thirty (30) days for either GOES P or GOES Q by the contractor, the contractor shall pay to the Government, for each calendar day of delay, beginning with the one hundred twenty- first day for GOES N, ninety-first day for GOES O or thirty-first day for any subsequent spacecraft, from the originally specified engineering handover date until the actual engineering handover date of said spacecraft, the sum of \$50,000, up to a maximum of \$\_\_\_\_\_, for each spacecraft. The form of payment, whether a contract credit or otherwise, will be determined by the Contracting Officer. The prices in this paragraph may be impacted by Clause H.16.

\* GOES-N = \$5,000,000 and GOES-O, P & Q = \$2,000,000 each

(b) Alternatively, if delivery or performance is so delayed, the Government may terminate this contract in whole or in part under the Default-Supply and Service clause in this contract and in that event, the Contractor shall be liable for \$50,000 per day, which shall not exceed the maximum of \$12,000,000, accruing until the time the Government may reasonably obtain delivery or performance of similar supplies or services. This clause shall not diminish any rights to which the Government is entitled under the Default clause or any other clause of this contract.

(c) The Contractor shall not be charged with late delivery fees or liquidated damages when the delay in delivery or performance arises out of causes beyond the control and without the fault or negligence of the Contractor as defined in the Default--(Fixed Price Supply and Service) (FAR 52.249-8) clause in this contract. Delay in delivery or performance due solely to the lack of availability of the Deep Space Network shall be considered to be beyond the control and without the fault or negligence of the contractor for the purposes of this clause.

(End of Clause)

**H.4 ADDITIONAL GOVERNMENT ACCOMMODATIONS**

a. During the first year of the contract, the Government may elect a one-time delivery slip to the Imager, Sounder and SXI instruments, along with the engineering handover dates, for all spacecraft, to the revised dates stated in this paragraph, with a change in the contract price of \$16,300,000 for GOES-N, \$62,700,000 for GOES-O, \$9,600,000 for GOES-P and \$2,400,000 for GOES-Q for an average of \$22,750,000 per mission. This paragraph may be impacted by Clause H.19. The revised dates are:

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	<u>Instrument Delivery</u>	<u>Earliest Ground Storage Date</u>	<u>Engineering Handover Date</u>
GOES N	10/01	1/01/03	4/30/03
GOES O	10/04	1/01/06	4/30/06
GOES P	10/06	1/01/08	4/30/08
GOES Q	10/08	1/01/10	4/30/10

b. For reasons other than the condition stated in paragraph a. above, the Government may delay the spacecraft test program by no more than thirty (30) days, twenty-eight (28) days for GOES N only, for late instrument deliveries or additional instrument accommodations. If this delay exceeds thirty (30) days, twenty-eight (28) days for GOES N only, the Government shall adjust the engineering handover date, for that spacecraft, on a day-for-day basis. The Government shall also pay to the contractor, for each spacecraft or replacement spacecraft, the daily rate below for the specified instrument.

In the event that the SXI flight instrument is delivered to the contractor in time to integrate it to the yoke prior to the GOES N Yoke Electrical Tests without delay to those tests, the contractor shall not be required to integrate the SXI engineering model and shall proceed directly to SXI flight instrument integration. In that case, the allowable Government delay of spacecraft test reverts back to thirty (30) days for GOES N.

	<u>GOES N</u>	<u>GOES O</u>	<u>GOES P</u>	<u>GOES Q</u>
SXI	\$ 24,000	\$ 25,000	\$ 18,000	\$ 25,000
Other	\$ 24,000	\$ 25,000	\$ 18,000	\$ 25,000

This rate applies to each calendar day of delay beginning with the thirty-first day from the originally specified delivery date until the actual date of said delivery. The prices in this paragraph may be impacted by Clause H.18.

If Government direction necessitates removing a Government furnished payload, other than SXI, from the spacecraft for repair or modification, the contract price will be adjusted by the ambient testing rate, as specified in paragraph e., for each additional day of testing, with no change to the engineering handover date. This clause does not apply to testing that is required to demonstrate that the contractor will meet specifications.

c. The Government may elect to integrate and test the SXI and/or Lightning Mapper instruments after the spacecraft has been placed into storage but in sufficient time as to not affect the engineering handover date. Should the Government elect to exercise this possibility, the

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this paragraph are not subject to the Disputes clause.

(End of Clause)

**H.9 SECTION H CLAUSES INCORPORATED BY REFERENCE**

**(1852.244-70) GEOGRAPHIC PARTICIPATION IN THE AEROSPACE PROGRAM  
(APRIL 1985)**

(End of By Reference Section)

**H.10 ELECTION OF GOVERNMENT-PROVIDED LAUNCH SERVICES AND  
ADVANCE AGREEMENT FOR DEDUCTIVE CHANGE FOR GOVERNMENT-  
PROVIDED LAUNCH SERVICES**

The term "contractor-provided launch services" as used in this clause shall mean the management or acquisition of any hardware, software, equipment, supplies, facilities or services by the Contractor, or any of its subcontractors, related to the provision of a launch vehicle, launch vehicle system or launch service in support of the launch of any spacecraft to be delivered under this contract. The term shall not include any obligation the Contractor has under the contract to integrate the spacecraft with a launch vehicle, to test the spacecraft during the course of integration with the launch vehicle system, or to provide any service in support of the spacecraft during any launch.

The Government may elect to provide launch services to the contractor for any spacecraft or its replacement, in lieu of contractor-provided launch services. The Government may invoke this deductive change through a unilateral modification to the contract, provided the Government has issued this modification at least 29 months prior to the engineering handover date for GOES N, 32 months prior to the engineering handover date for GOES O, 24 months prior to the engineering handover date for GOES P and 25 months prior to the engineering handover date for GOES Q. The respective contract line item in Clause B.1, contract price in Clause B.2, Performance Based Payments in Clause B.4 and option price in Clause H.1 shall each be reduced by the following amount:

GOES N	\$65,900,000
GOES O	\$70,200,000
GOES P	\$129,400,000
GOES Q	\$139,400,000

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The Contractor shall refund this amount to the Government or credit this amount to the Government against future payments under the contract as directed by the Contracting Officer. The Government reserves the right to unilaterally define the Event and amount of Performance Based Payments related to the credit referred to above.

If a unilateral modification electing Government-provided launch services is issued less than 29 months prior to the engineering handover date for GOES N, 32 months prior to the engineering handover date for GOES O, 24 months prior to the engineering handover date for GOES P and 25 months prior to the scheduled engineering handover date for GOES Q, the unilateral modification shall constitute a partial termination and shall be executed per the Advance Understanding in Clause H.11. The date of issuance shall be the effective date of the unilateral modification indicating election of Government-provided launch services.

The parties agree that this settlement represents fair compensation for Contractor effort accomplished for this change and that the terms as stated herein represent full and final settlement between the parties for any modification related to Contractor-provided launch services.

If the Government issues this Change Order, paragraph 3.8.3 of the Statement of Work shall be in effect and the following clauses shall no longer be in effect for that spacecraft only:

- H.11 ADVANCE UNDERSTANDING REGARDING SETTLEMENT OF  
TERMINATION OF CONTRACTOR PROVIDED LAUNCH SERVICES
- H.12 LICENSES AND PERMITS FOR A LAUNCH SERVICE OPERATOR
- H.13 GOVERNMENT INSIGHT AND APPROVAL FOR LAUNCH SERVICES

(End of clause)

**H.11 ADVANCE UNDERSTANDING REGARDING SETTLEMENT OF TERMINATION  
OF CONTRACTOR PROVIDED LAUNCH SERVICES**

The parties agree in advance to the following:

**(a) Definitions**

(1) The term "contractor-provided launch services" as used in this clause shall mean the management or acquisition of any hardware, software, equipment, supplies, facilities or services by the Contractor, or any of its subcontractors, related to the provision of a launch vehicle, launch vehicle system or launch service in support of the launch of any spacecraft to be delivered under this contract. The term shall not include any obligation the contractor has under the contract to



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**H.23 ADVANCE AGREEMENT FOR LAUNCH SERVICES ESCALATION COSTS**

The fixed price of this contract may receive a one-time adjustment for escalation costs associated with equitable adjustment of the engineering handover date for GOES N. The Contractor shall submit a proposal for the escalation costs only associated with adjusting the engineering handover date from October 31, 2002 to January 31, 2003. The price of GOES N may be increased by the amount of the equitable adjustment to be definitized after receipt of the proposal but not to exceed \$999,000. The Contractor shall assert the right to submit this proposal no later than July 31, 2001.

(End of clause)

**H.24 ADVANCE AGREEMENT FOR USING SPARE PARTS ON ADDITIONAL SPACECRAFT**

When NASA exercises Option 1 for GOES P under Clause H.1 OPTION FOR ADDITIONAL SPACECRAFT, NASA may unilaterally authorize the contractor to utilize item number 11a., GOES N/O Spares, in Clause B.1 DELIVERABLE REQUIREMENTS for this spacecraft. If this authorization is given, the firm fixed price of Option 1 shall be reduced by \$49,500,000. Once this reduction has been made, performance based payments for GOES P will be replaced with the list of events in Attachment N of this contract.

Further, if this authorization is given, the delivery of the GOES N/O Spares shall be delayed and the contractor shall retain title, possession, and risk of damage or loss of the GOES N/O spares until the final acceptance by the Government of the GOES P spacecraft. At such time as the Contractor shall tender the GOES P spacecraft for final delivery and acceptance by the Government, the contractor shall include in the document of delivery (DD-250), by separate line item, the tender of the basic contract item 11a. (GOES N/O Spares) for delivery and acceptance. The Government agrees that the delivery and acceptance of the GOES P spacecraft shall be sufficient to meet the criteria for the acceptance of basic contract item 11a. (GOES N/O Spares).

If NASA does not exercise Option 1, the contractor shall be entitled to an equitable adjustment for the costs associated with delivery and Government acceptance procedures of Contract Line Item Number 11a.

All other terms and conditions of the contract remain in effect for these options.

(End of clause)

**SECTION J OF NAS5-98069  
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LIST OF ATTACHMENTS**

**J.1 LIST OF ATTACHMENTS (GSFC 52.210-101) (OCT 1988)**

The following attachments constitute part of this contract:

<u>Attachment</u>	<u>Description</u>	<u>Date</u>
A	Statement of Work	August 26, 1997
B	Performance Specification	August 26, 1997
C	GOES-N-Q Imager Interface Control Document	Revision F
D	N-Q Sounder Instrument Interface Control Document	Revision F
E	Interface Control Document for the Solar X-Ray Imager (SXI)	Revision C
F	RESERVED	
G	Contract Document Requirements List	August 26, 1997
H	List of Government Furnished Property	August 26, 1997
I	Program Review Requirements	August 26, 1997
J	Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan	January 12, 1998
K	Performance Based Payments Completion Criteria	August 26, 1997
	Performance Based Payments Completion Criteria (Contractor Provided Milestones)	Revision A September 10, 1998
L	Interface Control Document for the Solar X-Ray Imager Ground Support Equipment and Hughes GOES Satellite (N,O,P,Q) Integration and Test	Revision B
M	GOES N/O Spares	October 2001
N	Performance Based Payments for Clause H.24	October 2001

(End of clause)

Three spacecraft emulators shall be fabricated, assembled, and tested that satisfy the requirements of S-415-22, section 11.3 and all subsections: one shall be for use at the spacecraft contractor's facility, and two shall be delivered to a government designated facility. (CCR4074A, Mod 13, Admin Change for Correction.)

(Two paragraphs deleted)

The spacecraft contractor shall provide training and training materials for all emulators provided in accordance with paragraph 11.3 of the Performance Specification, inclusive of the GFE Imager/Sounder and SXI simulators, in the following areas:

1. HSE related training for approximately ten government mission operations personnel providing hands-on emulator, including GFE Imager/Sounder and SCI simulators, training for:
  - a. Bringing up the emulator
  - b. Bringing up the SXI simulator
  - c. Connecting the emulator to GTACS using NTACTS or CORTEX emulation
  - d. Connecting the Imager/Sounder simulator component to SPS
  - e. Connecting the emulator to MRS&S
  - f. Configuring the emulator, Imager/Sounder simulator, and SCI simulator for specific simulation scenarios
  - g. Changing variables for the emulator, Imager/Sounder simulator, and SXI simulator for the purpose of validating different procedure paths
  - h. Changing variables and turning On/OFF modeling in the emulator
  - i. Monitoring simulation variables at the emulator
  - j. Verifying interconnections for all emulator and GFE simulator external interfaces
  - k. Troubleshooting interconnection problems for all emulator and GFE simulator external interface

(CCR4226C, Mod 49)

### 3.3.13.1 Emulator Warranty

The spacecraft contractor shall provide continuous hardware and software maintenance (i.e. parts and labor) support for all delivered spacecraft emulators and spacecraft contractor provided spare emulator boards (e.g. ETC, EACE) from the time of Final Acceptance by the government until October 7, 2003. The spacecraft contractor shall also maintain the Imager/Sounder Instrument simulator hardware for this same period. SXI Emulator hardware and software and Imager/Sounder Instrument simulator software maintenance remains the responsibility of the government.

During the period from Final Acceptance to October 7, 2003, the spacecraft contractor shall update the spacecraft emulator hardware and software with any changes associated with changes to the flight ACE hardware or software. Additionally, the spacecraft contractor shall support up to seven (7) simulation software upgrades to support GIR closure or database modifications.

Any problems or discrepancies encountered by the government during the maintenance period will be reported as GIRs and maintained in the NOAA ATS. GIRs identifying emulator non-conformity to Performance Specification requirements or failures in either emulator hardware or software, and are deemed necessary by the NASA/NOAA Ground System Review Board shall be fixed by the spacecraft contractor maintenance team during this period. The spacecraft contractor shall provide an emulator representative to participate on the NASA/NOAA Ground System

Review Board. Teleconference participation in review board meetings by this representative is acceptable. (CCR 6184B, MOD 59)

### **3.3.14 Space Environment Monitor Instruments**

The spacecraft contractor shall provide all personnel, facilities, services, and materials necessary to fabricate, assemble, and test the GOES N-Q Space Environment Monitor instruments (EPS, HEPAD, Magnetometer, XRS/EUV).

The Government will provide use of the Goddard Magnetics Test Facility, on a one-time only basis, for leading edge checkout of Space Environment Monitor instruments.

The Government will provide use of the Goddard Materials Engineering Branch Laboratory, on a one-time only basis during the summer 1999 time period, for Magnetometer printed circuit board coupon testing. (CCR4156A, Mod 29)

### **3.3.15 On-Board Computer (OBC)**

The spacecraft contractor shall provide all personnel, facilities, services, and materials necessary to fabricate, assemble, and test the GOES N-Q on-board computer(s).

### **3.3.16 INR Performance Evaluation System**

The spacecraft contractor shall provide all personnel, facilities, services, and materials necessary to fabricate, assemble, and test the design for two INR performance evaluation systems, one for the spacecraft contractor and one for NASA.

### **3.3.17 GOES N, O Spacecraft Spares**

The spacecraft contractor shall furnish all necessary personnel, facilities, services, and materials to support the fabrication, the assembly, and the test efforts for one full set of flight qualified GOES NO spares (except the optical bench and the thermal blankets). The spacecraft contractor personnel, facilities, service, and upkeep efforts, for the development of the spares, shall comply with the ground storage, the on orbit storage, and the on orbit operation lifetime mission requirements of the spacecraft. All subsystems and component testing shall be performed with calibrated GSE. All the spacecraft contractor practices, testing, and support as detailed by the Subsystem Fabrication, Assembly, and Test (Section 3.3 and subsections) shall be utilized. In the event that any of the GOES spare unit(s) is needed to replace a GOES N and/or GOES O flight unit, the spacecraft contractor shall replace the spare unit. (MOD 59, CCR 6184B)

## **3.4 Integration and Test**

The spacecraft contractor shall furnish all necessary personnel, facilities, services, and materials to support all integration and test efforts for GOES N-Q. The spacecraft contractor shall also provide the necessary technical efforts to assure that problems are adequately addressed as they arise. Spacecraft testing shall be performed with calibrated GSE. The spacecraft contractor shall prepare the spacecraft test data packages as defined in CDRL I&T-3.4.4-02.

The spacecraft contractor shall establish a system for trending test data of spacecraft components during spacecraft level testing. A matrix of the components being trended shall be presented at the PER and the trend data shall be presented during the PSR for each spacecraft. Additionally,

during the PER, the spacecraft contractor shall define for each parameter trended how the data is analyzed and interpreted with respect to the allowable test limits of the data as the testing progresses through the test phases. Any anomalous changes and/or trend(s) in the data shall be explained during the PSR. The spacecraft trend data shall be made available to government and authorized contractor personnel via the EDDS defined in section 1.3.1.

The spacecraft contractor shall prepare the launch commit criteria in accordance with CDRL I&T-3.4.6-02.

### **3.4.1 Management**

The spacecraft contractor shall provide the management functions necessary to support efforts associated with the integration and test activities for GOES N-Q. The spacecraft contractor shall develop all plans, procedures, and reports necessary to insure and document a successful spacecraft integration and test activity.

### **3.4.2 Bus Integration**

The spacecraft contractor shall provide all resources to perform all electrical, mechanical, and thermal integration and test efforts required for GOES N-Q.

### **3.4.3 Instrument and Test Equipment Integration**

#### **3.4.3.1 Instrument Delivery**

The spacecraft contractor shall provide the necessary clean room area, office space, and support to each instrument to aid in the effort associated with the post-ship/pre-integration functional testing of the GFE instruments.

#### **3.4.3.2 GFE Test Equipment Accommodation**

The spacecraft contractor shall accommodate the GFE instrument test equipment: floor space, clean room area, facility power, and other routine resources shall be provided for the instrument EGSE, collimators, integrating spheres, and support equipment. The spacecraft contractor shall integrate the GFE instrument GSE with the spacecraft GSE in accordance with the GSE interface ICD. The spacecraft thermal/vacuum chamber shall accommodate infrared targets, space target(s), radiative heating elements as required, and the associated target controllers, plumbing, and wiring. The spacecraft contractor shall design and build the mechanical fixtures necessary to mount and align the GFE targets and equipment in the thermal vacuum chamber. The spacecraft contractor shall integrate the instrument test equipment into the thermal/vacuum chamber with the assistance of the instrument contractors. The spacecraft contractor shall provide the coolants to operate the GFE targets. The spacecraft contractor shall provide facilities to store the GFE test equipment delivered to its facility when the equipment is not in use. GFE test equipment accommodations shall be developed jointly between the spacecraft and instrument contractors, and documented in the GFE Instrument Interface Document for each GFE instrument.

### **3.4.3.3 GFE Test Equipment Validation (GOES-N Only)**

For the GOES-N spacecraft only, the spacecraft contractor shall support the validation of GFE thermal/vacuum test equipment by assisting with the installation of the GFE thermal/vacuum equipment in the chamber, along with any spacecraft fixtures or equipment needed to support the instrument equipment, and executing a thermal cycle in vacuum in order to verify heater and target operation.

### **3.4.3.4 Prototype Instrument Integration and Test (GOES-N Only)**

For the GOES-N spacecraft only, the spacecraft contractor shall integrate the prototype GFE Imager and Sounder and engineering model SXI instruments onto the spacecraft and provide access to the spacecraft, the spacecraft GSE, and personnel to support instrument testing and GSE interface verification for a duration of 40 ± 16-hour days. Spacecraft integration and testing may be conducted in parallel if it does not interfere with or compromise instrument testing.  
(CCR4226C, Mod 49)

### **3.4.3.5 Flight Instrument Integration**

The spacecraft contractor shall provide all resources necessary to perform the electrical, mechanical, and thermal integration of the Imager, Sounder, Solar X-ray Imager, and Space Environment Monitor instruments onto the spacecraft. The spacecraft contractor shall develop and maintain integration and handling procedures which are agreeable to the instrument contractors.

In the spacecraft contractor's SXI integration sequence, the contractor shall allot one day for the SXI contractor to execute an SXI functional test after each major integration step; for example, after SXI integration to the mounting panel; after mounting panel integration to the solar array yoke; and after yoke integration to the spacecraft body. If any of these major integration steps are subsequently reversed (e.g., if the yoke is removed from the spacecraft), the spacecraft contractor shall allot one day for the SXI functional test after the de-integration step and then one other day after the re-integration step. These test times are in addition to those defined in Table 3.4.5.1. Spacecraft integration and testing may be conducted in parallel if it does not interfere with or compromise SXI testing. The SXI functional test will be executed by the SXI contractor with support from the spacecraft contractor.

#### **3.4.3.5.1 Flight Instrument Integration (GOES-N only)**

In addition to the times allocated in other sections of this SOW, for GOES-N only, allocate 19 days each (38 total) for the Imager and Sounder contractor to perform systems tests and electrical interface tests of the flight instruments to be performed in conjunction with safe-to-mate tests.  
(CCR4226C, Mod 49)

For GOES-N only, the spacecraft contractor shall de-integrate the SXI engineering model and retrofit an SXI flight instrument onto the GOES N yoke mounting panel prior to the following GOES N spacecraft tests: EMI/EMC, Stray Magnetic Fields, RF Airlink, Acoustic, Sine Vibration, Pyroshock, ETE Test #2, and Spacecraft Thermal Vacuum. The integration and test activities for the SXI flight instrument shall be conducted in accordance with paragraph 3.4. In the event that the SXI flight instrument is delivered to the contractor in time to integrate it to the yoke prior to the GOES N Yoke Electrical Tests without delay to those tests, the contractor shall

not be required to integrate the SXI engineering model, and shall proceed directly to SXI flight instrument integration. (CCR 6184B, MOD 59)

#### **3.4.4 Functional Tests**

The spacecraft contractor shall provide all test facilities and all the resources necessary to define, prepare, perform, document, and analyze all functional and performance tests associated with GOES N-Q. The spacecraft contractor shall conduct functional testing as defined in S-415-22 section 8.0. In addition, launch vehicle adapter compatibility shall be verified by test on all spacecraft prior to shipment to the launch base. System testing is defined in section 3.6.2.3

All electrical interfaces shall be verified prior to any first time connection. Safe-to-mate procedures shall be implemented for all interfaces between any two of the following: spacecraft, GFE, EGSE, pyrotechnics, electrical explosive devices, SSGS, ATE, and any facility power. The EGSE shall be demonstrated to NASA to verify that it is adequate for the intended use. EGSE shall be under configuration control prior to the demonstration, and prior to use for spacecraft tests. The spacecraft contractor shall ensure that the instrument GSE is on, operational, and properly connected to the spacecraft GSE prior to any powered testing of an instrument.

The SXI GFE instrument shall be allotted 20 hours for safe-to-mate/electrical signal characterization activities as defined in the SXI/Spacecraft GSE ICD. Twenty (20) hours shall be allotted for the SXI Engineering Model and each and every SXI Flight Model. (CCR4174)

Government and GFE contractor support for activities involving GFE instruments is defined in Table 3.4.5.1. (CCR 6184B, MOD 59)

##### **3.4.4.1 GOES-N Functional Tests With GFE Prototype Imager, Sounder and Engineering Model SXI**

For the GOES-N spacecraft only, the spacecraft contractor shall perform the following tests after integration of the prototype Imager and Sounder instruments and an engineering model of the SXI:

1. A test with the spacecraft suspended with all mechanisms operating in an on-orbit mode to measure dynamic interactions between spacecraft and instrument components. The spacecraft contractor may substitute a similarly comprehensive test using the prototype Imager and Sounder instruments and engineering model SXI to verify dynamic interactions between the instruments and spacecraft mechanisms.
2. A test with all communications functions and instruments operating in an on-orbit mode to measure electromagnetic interactions between the spacecraft and instruments.

The times for these tests are not included in the instrument schedule duration.

##### **3.4.4.2 GOES N-Q Functional Tests with Flight Instruments**

The spacecraft contractor shall set aside the schedule durations defined in Table 3.4.5.1 for instrument functional testing at the test phases indicated. The spacecraft contractor shall provide access to the spacecraft, spacecraft GSE, and personnel as required to support the testing. The spacecraft contractor shall support instrument Pre-Vibration Functional Testing by orienting the spacecraft such that the Imager and Sounder cooler cover door hinge axes and telescope optical

axes are perpendicular to the ground. If the SXI is integrated on the solar array yoke when a first-motion and/or deployment test of the solar array is performed (during the Baseline Performance and/or the Launch Base Functional phase), the spacecraft contractor shall divide the test time allotted for the SXI in Table 3.4.5.1 such that there are at least two days of SXI test time both before and after the array test. Spacecraft testing may be conducted in parallel if it does not interfere with or compromise instrument testing.

In addition, the spacecraft contractor shall perform the following tests with the flight instruments for each of the GOES N-Q spacecraft.

1. A test with the spacecraft suspended with all mechanisms operating in an on-orbit mode to measure dynamic interactions between spacecraft and instrument components. The spacecraft contractor may substitute a similarly comprehensive test using the Imager, Sounder, and SXI instruments to verify dynamic interactions between the instruments and spacecraft mechanisms.
2. A test to measure the spacecraft magnetic dipole.
3. A test with all communications functions and instruments operating in an on-orbit mode to measure electromagnetic interactions between the spacecraft and instruments.
4. Calibration of all flight sensors (actual vs measured) and mechanisms (actual vs commanded).

The time for these tests are not included in the instrument schedule duration.



### 3.4.4.3 INR Pre-launch Spacecraft Test Requirements

The spacecraft contractor shall perform the tests necessary to verify the successful system integration of the Imager/Sounder, SSGS and spacecraft subsystems comprising and/or supporting the INR subsystem (CDRL SE-2.4-01). These tests shall verify that GOES N-Q meets the INR derived requirements and objectives, based on the INR specifications. (CCR4226C, Mod 49)

The contractor shall propose the tests to be performed; provide the test plan and test procedure in accordance with CDRL SE-2.4-01; provide the necessary input data, files, etc. required to perform the test; and conduct the actual testing. The spacecraft contractor shall provide a standard format to be used to report the results of all tests. (CCR4226C, Mod 49)

Consistent with the reporting requirements provided in the PVP, CDRL SE-2.4-01, the spacecraft contractor shall evaluate and document the findings and all analyses of the data and information from all tests, including unit level testing, development/bench testing, qualification testing, acceptance testing, and compatibility testing of the INR-related flight and ground support hardware, software and algorithms. (CCR4226C, Mod 49)

The spacecraft contractor shall provide and maintain an INR test schedule showing initial availability of each unique GSE and any associated software required for the conduct and/or analysis of the test results. The test schedule shall reflect the requirement for any government furnished data, such as star/landmark data from on-orbit spacecraft (GOES I/M series).

#### 3.4.4.3.1 Spacecraft Subsystem Tests

The purpose of subsystem testing is to verify the functional and computational performance of all spacecraft INR subsystem components and software elements. This shall be accomplished by closed loop testing of all INR components and software elements provided by the contractor and shall exercise all electrical interfaces using test scenarios which duplicate the worst case on-orbit operational modes and geometries. The output of all subsystem components and software elements will be verified both qualitatively and quantitatively. In particular, the comprehensive verification of all INR compensation signals shall be demonstrated during these tests. One important aspect of this testing shall be the confirmation that compensation signals are compatible with the instrument servos. Exercising of the ACS may be accomplished using simulated sensor/actuator signals and/or dynamic simulation with a controllable platform. ~~External~~ Interfaces with the INR spacecraft subsystem during these tests, such as with instruments and ground system elements, shall be provided by flight-like hardware, emulators and/or dynamic simulation. In support of these tests, the spacecraft contractor shall provide the data ingest, archive and processing capability to quickly and accurately verify all INR related signals and on-board computations. (CCR4226C, Mod 49)

The spacecraft contractor also shall prepare INR related system performance reports in accordance with CDRL SDA-3.2.16-02.

#### 3.4.4.4.2.4 Transponder Characterization With Input Noise

Each transponder shall be characterized using a spectrum analyzer swept over a frequency range 1.25 times the channel bandwidth with the input to the transponder terminated in its characteristic impedance.

#### 3.4.4.4.2.5 Apparent Noise Figures For the PDR, WEFAX, DCPI and EMWIN

The apparent PDR, WEFAX, DCPI and EMWIN channel noise figures shall be determined from the ratio of the output signal-to-noise to the input signal-to-noise. The input test signals shall be from a test source with a 290 Kelvin noise source. This test shall be done at a minimum of five input signal levels spanning the input dynamic range and at three ambient temperatures: acceptance high and low, and within the mission allowable range.

#### 3.4.4.4.3 RF Airlink Test

An RF airlink test shall be performed to measure EMC/EMI and other effects. This test shall be done with all spacecraft antennas installed and radiating, and in an area confirmed to have a suitable electromagnetic environment for conducting the test. As a part of the test configuration, a separate receiver and supporting test equipment shall be provided to monitor the instantaneous background interference in all test bands. Antennas shall be used to inject signals into the DSN, UHF and S-band channels. The interference measurements for each band shall be determined via cabling from the transmit test ports of the antenna couplers.

Testing shall be performed to determine the presence of interference caused by any GOES components and subsystems, and shall include tests of the ACS, and instruments. The instrument signals also shall be examined for coherent noise in the output data.

#### 3.4.4.4.4 DCPR 8 PSK End-to-End BER Demonstration Test

The spacecraft contractor shall perform a one-time end-to-end BER test on the GOES N or O spacecraft to verify the compatibility of a GFE 8 PSK modem pair (uplink and downlink) with one of the GOES N-Q spacecraft. The spacecraft contractor BER STE in combination with the GFE modem pair shall comprise the required test set. The spacecraft contractor BER STE shall consist of all the required frequency conversion, noise level set, and bit stream transmitters and receivers. The combined test equipment shall be used to measure BER as a function of Eb/No for the service downlinks. The Government will ensure that the GFE modem interconnects with the spacecraft contractor BER STE without modification of the spacecraft contractor STE. Three configurations shall be used in the test. In the first configuration, the STE including the GFE modem pair shall be connected together by a simple loopback to establish a baseline for the other measurements. The second configuration characterizes the combined response of the DCPI satellite channel, GFE modems, and the spacecraft contractor BER STE *without* adjacent channel interference. The third configuration characterizes the combined response of the DCPR satellite channel, GFE modems, spacecraft contractor BER STE with interference from adjacent operating satellite channels. (CCR 6184B, MOD 59)

Data for each curve shall be collected using the 8PSK waveform running at 1.2 kbps. For each curve, six (6) data points will be collected and the last point will be at an error rate of approximately  $10^{-6}$ . The test shall use only the primary receiver and only the domestic band.

In support of the test, the spacecraft contractor shall develop and release via Special Test Request (STR) a test plan and test procedure. The plan and procedure shall be provided to the government for review. Prior to the test, the spacecraft contractor shall hold a test readiness review. Following the completion of the test, the spacecraft contractor shall issue a test report, which summarizes the findings of the test. (CCR 6184B, MOD 59)

Testing for the three test configurations shall be allocated 7 days/3 shifts. The allocated time for this test includes pre-test setup, test execution, and post-test deconfiguration. Debug activities shall be limited to those necessary to establish valid test configurations and resolve test execution deficiencies. Anomalies encountered during the testing shall be tracked by the spacecraft contractor's test anomaly tracking system. The DCPR 8PSK BER Demonstration Test shall be performed no later than GOES N PSR minus 2 months. The test shall be scheduled by the spacecraft contractor to minimize the schedule disruption and will use spacecraft flight hardware to the maximum extent possible. (CCR 6184B, MOD 59)

### **3.4.5 Environmental Tests**

The spacecraft contractor shall provide all test facilities and all the resources necessary to define, prepare, perform, document, and analyze all functional and performance tests associated with GOES N-Q. The spacecraft contractor shall conduct environmental testing as defined in S-415-22, section 8.0. The spacecraft contractor shall ensure that the instrument GSE is on, operational, and properly connected to the spacecraft GSE prior to any powered testing of an instrument.

#### **3.4.5.1 GOES N-Q Environmental Tests with GFE Instruments**

The spacecraft contractor shall schedule the following work days per GFE instrument (i.e., multiply by 3 for the Imager, Sounder, and SXI) for instrument testing during spacecraft environmental testing. GFE Instrument test durations defined in Table 3.4.5.1 assume a 24-hour work day during thermal vacuum testing, and a 16-hour work day for other phases. Government and GFE contractor support during activities involving GFE instruments is defined in Table 3.4.5.1. Durations may be adjusted to accommodate the spacecraft nominal work day as long as the total number of test hours remains constant. The spacecraft contractor shall provide access to the spacecraft, spacecraft GSE, and personnel as required to support the testing. Spacecraft testing may be conducted in parallel if it does not interfere with or compromise instrument testing. The spacecraft contractor shall allow GFE instrument tests to be conducted in parallel with spacecraft testing if they do not interfere with or compromise spacecraft testing. The spacecraft contractor shall keep the GFE instruments on and operating during temperature transitions at all times possible. (CCR 6184B, MOD 59)

Table 3.4.5.1

## GFE Instrument Test Program Requirements

Test Phase	Days Per Instrument**	Additional Requirements
Baseline Performance	10 (30 total)	As defined in section 3.4.4.2
Pre-Vibration Functional	0.5 (1.5 total)	
Post-Vibration Ambient	1 (3 total)	Imager/Sounder cooler door axis vertical
TV Eqpt. Install/checkout/align	3 total	Instrument manufacturing preparations for T/V conducted in parallel
Pre-TV (ambient in chamber)	2 (6 total)	Perform dynamic interaction test
High Temp. Outgassing	8 total*	Note: 7 days outgassing + 1 day for cooler cool down
TV "Hot" Plateau	4 (12 total)	Perform dynamic interaction test. Limit activities which disturb instrument temperature stability.
Mission Ops ETE Test #3	1.33 (32 hrs)	As defined in section 3.6.2.3.2.3
TV "Cold" Plateau	4 (12 total)	Limit activities which disturb instrument temperature stability. Perform dynamic interaction test
Post-TV (ambient in chamber)	2 (6 total)	
Post-TV/Pre-Ship Functional	8 (24 total)	Imager/Sounder cooler door axis vertical, Perform wide field collimator test
Preparation for shipment	2 total	
Launch Base Functional	5 (15 total)	As defined in section 3.4.6.1

\* 7 day outgassing is the nominal duration. Outgassing shall continue until TQCM and RGA measurements satisfy the contamination requirements of S-415-22, section 10.11.

\*\* During SCTV phases, the government and GFE contractors shall support 24 hour work days, 7 days a week as required for activities involving GFE instruments. During non-SCTV phases, the government and GFE contractors shall support 16-hour work days as required for activities involving the GFE instruments, except for GOES N and O where the government and GFE Imager/Sounder contractor shall support up to 52 (GOES N) and 44 (GOES O) 24-hour work days 6 days a week as required for activities involving the GFE instruments. (CCR 6184B, MOD 59)

The spacecraft contractor shall perform a test with the spacecraft suspended with all mechanisms operating in an on-orbit mode to measure dynamic interactions between the spacecraft and instrument components at the thermal vacuum test mission high and low plateaus. The spacecraft contractor may substitute a similarly comprehensive test using the Imager, Sounder, and SXI instruments to verify dynamic interactions between the instruments and spacecraft mechanisms.

The spacecraft contractor shall support the Imager, Sounder, and SXI testing following both the vibration and thermal vacuum tests. For the Imager and Sounder the spacecraft shall be oriented with the cooler cover door axes and the telescope optical axes perpendicular to the ground.

The spacecraft contractor shall repeat the wide field of view collimator test following the thermal vacuum test.

#### **3.4.5.2 Visual Monitoring of Imager and Sounder Louvers during Thermal Vacuum Testing**

The spacecraft contractor shall provide the capability to visually monitor the Imager and Sounder louvers during spacecraft level thermal vacuum testing, using two CCTV cameras, two monitors and two VCR's (all provided by the spacecraft contractor). The spacecraft contractor shall provide a fixed mount and mount the two CCTV cameras inside the TV chamber, with an acceptable view of the Imager and Sounder Louvers. A location shall be provided external to the chamber, for viewing the television monitors. Electrical power along with cables, TV chamber feedthroughs, and thermal control (heaters/MLI) to maintain the CCTV cameras within an acceptable operating temperature range, shall be provided and installed. (CCR4175B, Mod 36)

#### **3.4.5.3 Imager and Sounder Louver Thermal Stimulation**

The spacecraft contractor shall provide the capability to actuate the Imager and Sounder louvers during spacecraft level thermal vacuum testing. (CCR4226C, Mod 49)

#### **3.4.6 Launch Site Tests**

The spacecraft contractor shall prepare a launch site integration plan as defined in CDRL I&T-3.4.6-01.

##### **3.4.6.1 GFE Instrument Tests**

The spacecraft contractor shall set aside the launch base functional schedule duration as defined in Table 3.4.5.1 for instrument functional testing and launch readiness activities, including the inspection and cleaning of the radiant coolers and optical cavities. The spacecraft contractor shall provide access to the spacecraft, spacecraft GSE, and personnel as required to support the testing and launch readiness activities. The spacecraft contractor shall support instrument testing by orienting the spacecraft such that the Imager and Sounder cooler cover door hinge axes and telescope optical axes are perpendicular to the ground. The spacecraft contractor shall support launch readiness activities by preparing a class 10,000 clean area where the optical cavities and coolers may be uncovered for inspection and cleaning. The spacecraft contractor shall prepare any lifts/scaffolding required to allow instrument personnel to access the optical cavities and coolers for cleaning activities. The spacecraft contractor shall ensure that the instrument GSE is on, operational, and properly connected to the spacecraft GSE prior to any powered testing of an instrument.

Spacecraft testing may be conducted in parallel if it does not interfere with or compromise instrument testing.

#### **3.4.7 Ground Support Equipment**

The spacecraft contractor shall provide all the resources required for the design, development, procurements, fabrication, and test of all electrical ground support equipment (EGSE), mechanical ground support equipment (MGSE), and targets necessary to completely test the spacecraft and verify it meets the specified performance. This includes:

S-415-23 GOES N-Q Statement of Work

1. Special equipment necessary to handle, store, and transport the spacecraft or its components and any equipment used to perform off spacecraft mechanical testing of appendages or other equipment during integration and test.
2. Automated data processing equipment and software necessary to control and monitor the spacecraft, run the test procedures, and analyze, display and plot the test data.
3. MGSE required to handle and test the SXI in conjunction with the spacecraft.

The spacecraft contractor is responsible for the calibration of the GSE it provides and the instrument contractors are responsible for the calibration of the GFE GSE.

9.2.2.1 *Envelope & Mass* - The spacecraft and launch vehicle design shall accommodate an Imager sensor module, electronics module, and power supply of the mass and dimensions defined in the Imager ICD. The spacecraft shall include margin for a growth in the total mass of the GOES-N Imager up to 313 lb (142.0 Kg) and of the GOES O, P, and Q Imagers to 316 lb (143.3 Kg.). (MOD 32, CCR 4166; MOD 59, CCR 4173)

9.2.2.2 *Access Provisions* - The spacecraft-Imager interface design shall allow the removal of any individual Imager module without removal of other instrument modules or spacecraft components. The spacecraft-Imager interface design shall also allow removal of spacecraft modules and components without removing or disturbing any Imager module.

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9.2.3 *Electrical Interface* - The spacecraft shall meet the following additional electrical interface requirements:

9.2.3.1 *Cross-strapping* - All inputs and outputs between the Imager and the spacecraft shall be redundant, including command, mirror compensation, and data and telemetry transmission. The spacecraft shall provide cross-strapping to operate side one or two of the Imager electronics with either side of the spacecraft electronics.

9.2.3.2 *Power Consumption* - The spacecraft shall provide power for Imager operations as defined in the Imager ICD. The spacecraft shall provide 6% power margin over the sum of the Imager and Sounder average on-orbit power consumption while scanning a frame as defined in 3.4.2.3.3 Average Power Draw While Scanning section of the Imager and Sounder ICDs during initial outgas and normal operation modes at BOL and EOL.

The power requirements stated in the Imager ICD for thermal control are dependent on the spacecraft to instrument interface design and the attitude of the instruments relative to the Sun during launch, transfer orbit, and on-orbit storage. The requirements are considered satisfied if the power supplied is sufficient to maintain the instrument components within their mission allowable temperatures.

9.2.3.3 *Static Charging* - Precautions shall be employed to ensure electrostatic discharge (ESD) is avoided and static charging on surfaces adjacent to or near the instrument are minimized through selection of materials and implementation of appropriate processes.

9.2.3.4 *Electromagnetic Interference (EMI)* - The spacecraft shall comply with the EMI requirements specified in the Imager ICD. In the case of a conflict between the ICD and Section 8.4 of this specification, the ICD shall govern.

9.2.4 *Command Interface* - The spacecraft shall process and distribute command signals to the Imager. The spacecraft-Imager command interface shall be consistent with the data content and signal characteristics defined by the Imager ICD. The spacecraft shall include margin for a 10% growth in the number of Imager pulse commands.

#### 9.2.5 *Data Handling*

9.2.5.1 *Wideband Data Transmission* - The spacecraft shall transmit the Imager wideband data stream continuously via the sensor data downlink. Data shall be transmitted to the ground station within 29 seconds of its receipt from the Imager. The spacecraft-Imager wideband interface shall be consistent with

9.3.2.1 *Envelope and Mass* - The spacecraft and launch vehicle design shall accommodate a Sounder sensor module, electronics module, and power supply of the mass and dimensions defined in the Sounder ICD. The spacecraft shall include margin for a growth in the total mass of the Sounder up to 339 lb (154.1 Kg.). (MOD24, CCR 4139; MOD28 (Admin Chg.), MOD32, CCR4166; MOD 59, CCR4173)

9.3.2.2 *Access Provisions* - The spacecraft-Sounder interface design shall allow the removal of any individual Sounder module without removal of other instrument modules or spacecraft components. The spacecraft-Sounder interface design shall also allow removal of spacecraft modules and components without removing or disturbing any Sounder module.

9.3.3 *Electrical Interface* - The spacecraft shall meet the following additional electrical interface requirements:

9.3.3.1 *Cross-strapping* - All inputs and outputs between the Sounder and spacecraft shall be redundant, including command, mirror compensation, and data and telemetry transmission. The spacecraft shall provide cross-strapping to operate side one or two of the Sounder electronics with either side of the spacecraft electronics.

9.3.3.2. *Power Consumption* - The spacecraft shall provide power for Sounder operations as defined in the Sounder ICD. The spacecraft shall provide 6% power margin over the sum of the Imager and Sounder average on-orbit power consumption while scanning a frame as defined in 3.4.2.3.3 Average Power Draw While Scanning section of the Imager and Sounder ICDs during initial outgas and normal operation modes at BOL and EOL.

The thermal control power requirements stated in the Sounder ICD are dependent on the spacecraft-to-instrument interface design and the attitude of the instruments relative to the Sun during launch, transfer orbit, and on-orbit storage. The requirements are considered satisfied if the power supplied is sufficient to maintain the instrument components within their MATs.

9.3.3.3 *Static Charging* - Precautions shall be employed to ensure ESD is avoided and static charging on surfaces adjacent to or near the instrument are minimized through selection of materials and implementation of appropriate processes.

9.3.3.4 *Electromagnetic Interference (EMI)* - The spacecraft shall comply with the EMI requirements specified in the Sounder ICD. In the case of a conflict between the ICD and Section 8.4 of this specification, the ICD shall govern.

9.3.4 *Command Interface* - The spacecraft shall process and distribute command signals to the Sounder. The spacecraft-Sounder command interface shall be consistent with the data content and signal characteristics defined by the Sounder ICD. The spacecraft shall include margin for a 10% growth in the number of Sounder pulse commands.

### 9.3.5 *Data Handling*

9.3.5.1 *Wideband Data Transmission* - The spacecraft shall transmit the Sounder wideband data stream continuously via the sensor data downlink. Data shall be transmitted to the ground station within 29 seconds of its receipt from the Sounder. The spacecraft-Sounder wideband telemetry interface shall be consistent with the data content and signal characteristics defined by the Sounder ICD. The spacecraft



**Updated to Mod 59**

**Attachment H**

**LIST OF GOVERNMENT FURNISHED PROPERTY**

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**August 26, 1997**

## LIST OF GOVERNMENT FURNISHED PROPERTY

ITEM (GFP)	DATE AVAILABLE	LOCATION (SOW)
Finite Element Models Imager Sounder SXI	SCR SCR SCR	3.2.2.1
Thermal Models Imager (Detailed TMG) Sounder (Detailed TMG) SXI (Reduced Thermal Model)	SCR SCR SCR	3.2.5.1
Thermal Distortion Models Imager Sounder	SCR SCR	3.2.5.3
Test Execution System (TES)	July 1999	
Prototype Instruments S/N02 Imager S/N02 Sounder SXI Mass Model SXI Engineering Model	July 1999 July 1999 Sept. 1, 1999 October 2, 2000	3.4.3.1
Flight Instruments S/N08 Imager S/N08 Sounder S/N09 Imager S/N09 Sounder <u>S/N10 Imager</u> <u>S/N10 Sounder</u> S/N11 Imager S/N11 Sounder. <u>SXI-N</u> (MOD 59, CCR6184B)  SXI-O SXI-P SXI-Q	December 1, 2000 December 1, 2000 April 2001 April 2001 <u>August 2003</u> <u>August 2003</u> April 2005 April 2005 <u>No earlier than Oct. 15, 2001</u> <u>No later than the start of GOES N</u> <u>EMI/EMC S/C-level test minus</u> <u>4 weeks</u> April 2002 <u>October 2003</u> April 2007	
Tooling Plates & Associated Drawings Imager Sounder	March 1999 March 1999	
Instrument Drawings & ICDs Imager Sounder SXI	Award Award Award	

Instrument Operations Documentation Imager Sounder SXI	Inst. Del'y - 3 Mo. Inst. Del'y - 3 Mo. Inst. Del'y - 3 Mo.	3.6.1.2
Instrument Simulators Imager Sounder SXI	GOES-N *ESD - 20 Mos. GOES-N ESD - 20 Mos. February 28, 2000	
IR Calibration Targets (T/V Testing) (And associated controllers, plumbing, etc.): Space Targets (T/V Tests) Cooler Targets (T/V Tests) Narrow Field Collimator (Ambient Test) Integrating Sphere (Ambient Test) Imager/Sounder Lifting Fixture	S/N08 Del'y S/N08 Del'y S/N02 Del'y S/N02 Del'y S/N02 Del'y	
Wide Field Collimator with Targets	March 1999 thru November 1999 and March 2000	3.4.4.3.1.2
SSGS Related Information GOES I/M Sftwr. & Databases GOES I/M Documentation (Electronic)		3.5 GFE (1) GFE (2)
GOES N Ground Network Compatibility Test Suite	Prior to In-Plant Environment Tests	3.6.2.1.1
SXI Data Playback Unit	January 15, 2000	
<u>DCPR Uplink, Downlink Modems &amp; interconnect hardware (MOD 59, CCR6184B)</u>	<u>October 1, 2001</u>	<u>3.4.4.4.4</u>

\*ESD = Earliest Storage Date

INDIVIDUAL SUBCONTRACTING PLAN

DATE: 10/23/01 PLAN # SC97-04-E

CONTRACT/RFP #: NAS5-98069 RFP 214.2 dated 8/31/01

BOEING REFERENCE #: L0226

MODIFICATION # Revision #2

REFERENCE: Boeing's FY 2001 Master Subcontracting Plan - Document No. D658-10340-8

Boeing's FY 2001 Master Subcontracting Plan, Document No. D658-10340-8 is hereby incorporated and applies company-wide to The Boeing Company, including its subsidiaries. . The plan contains all elements required in Subcontracting Plans by FAR 52.219-9 except goals. The FY 2001 plan has been approved for use during fiscal year 2001, beginning October 1, 2000, through fiscal year 2003, ending September 30, 2003. This Individual Subcontracting Plan is issued pursuant to the Master Subcontracting Plan and shall apply to the prime contract throughout the life of the contract and to any prime contract changes, modifications and options.

Approval:



Louise Erickson

Small Business Programs Manager

Boeing Satellite Systems

## INDIVIDUAL SUBCONTRACTING PLAN

Submitted By:

Group  
Address  
City, State

Boeing Satellite Systems, Inc.  
P.O. Box 92919  
Los Angeles, California 90009

Plan Administrator:

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J.D. Butler  
Defense Contract Management Agency  
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## 1. CONTRACT INFORMATION

Contract/RFP No.	<u>NAS5-98069 (stand alone modification)</u>
Description	<u>GOES O Spares Proposal</u>
Period of Performance	<u>1 November 2001 to 31 January 2003</u>
Effective Date of Contract	<u>1 November 2001 (estimated)</u>
Change No.	Date:

## 2. VALUES

Total Current Contract Value	\$ <u>49,500,000</u>	<u>100%</u>
Planned Subcontract Dollars	\$ <u>15,914,704</u>	<u>30.54%</u>
Domestic Subcontract Dollars	\$ <u>13,495,026</u>	<u>25.90%</u>

## 3. GOALS

For the purpose of this individual subcontracting plan, the following separate percentage goals are hereby expressed in terms of a percentage of the total planned domestic subcontract dollars. These planned subcontract dollars include all first tier subcontracts to be awarded in the performance of this contract.

BSS hereby commits to perform to their best efforts to meet or exceed the following goals:

PLANNED SUBCONTRACT BASE:	<u>AMOUNT</u>	<u>PERCENT</u>
1. Total Dollars	\$ <u>13,495,026</u>	<u>100</u> %
2. To Large Business	\$ <u>7,018,458</u>	<u>52</u> %
3. To Small Business	\$ <u>6,476,568</u>	<u>48</u> %

SMALL BUSINESS CONCERNS:	<u>AMOUNT</u>	<u>PERCENT OF ITEM 1 TOTAL</u>
4. Small Disadvantaged Business	\$ <u>678,767</u>	<u>5</u> %
5. HBCUs/MIs	\$ <u>0</u>	<u>0</u> %
6. Small Woman Owned Business	\$ <u>202,425</u>	<u>1.5</u> %
7. Veteran Business	\$ <u>N/A</u>	<u>N/A</u> %
8. Service-Disabled Veteran Business	\$ <u>N/A</u>	<u>N/A</u> %
9. HUBZone Business	\$ <u>N/A</u>	<u>N/A</u> %

#### COMMENTS RELATIVE TO STATED GOALS:

GOES O spare satellite is a reprourement of existing parts. The majority of the parts have already been through a significant non-recurring engineering effort. We have also invested in manufacturing aids for the manufacture of these parts. Although a significant amount of the work was accomplished by small businesses, the majority of the work has been accomplished by large business. To change suppliers at this time would not be cost effective. The balance of the expected subcontracting consists of various mechanisms, high reliability materials, harnesses, and other items per Attachment A. Of these miscellaneous planned expenditures of \$2.188 mill, we will make every effort to capture these in small disadvantaged businesses and woman owned businesses. We will split this expenditure in half as a goal with the intent to capture half in each category. Items 7 through 9 are not part of the original Subcontract Plan. All of the planned subcontract dollars represent a change of scope to the existing GOES subcontracts.

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#### 4. MODIFICATIONS

Upon receipt of a modification to this contract exceeding the \$500,000 threshold, (\$1,000,000 for construction), Boeing will promptly negotiate applicable revisions to the appropriate subcontract goal reflecting those changes.

#### 5. TECHNICAL ASSISTANCE TO SMALL BUSINESS CONCERNS

In addition to those actions described in the Master Subcontracting Plan, the following specific efforts will be undertaken to ensure these concerns receive an opportunity to participate in the performance of this contract as subcontractors and to aid in the achievement of the above stated goals:

#### 6. PRINCIPAL PRODUCTS AND SERVICE AREAS

Appendix A attached hereto contains a description of the principal supply and service areas scheduled to be subcontracted and identification of those areas anticipated to be subcontracted to small business concerns.

#### 7. PLAN ADMINISTRATOR

Responsibility for the implementation and administration of this subcontracting plan is vested in the responsible Plan Administrator whose name appears on the cover sheet. Hughes reserves the right to substitute another qualified individual as Plan Administrator should the need arise. The duties of the Plan Administrator shall include but not be limited to the following:

- a) Prepare small business subcontracting plans that include percentage goals, a description of efforts facilitating small business participation, and assurances that subcontracts contain flow-down provisions.
  - b) Assure Materiel contract briefs disclose terms and conditions of the company concerning small business plans including provisions for incentive award fees and reporting requirements and make certain that such briefs are distributed to all performing organizations.
  - c) Ensure that small business capabilities are adequately considered and that such firms are listed as potential sources on the make-or-buy plan.
- 
- d) Bring to management's attention any matter that could impair accomplishment of goals specified in subcontracting plans that might adversely affect the company.



## APPENDIX A

### PRINCIPAL PRODUCTS AND SERVICE AREAS BY BUSINESS SIZE CATEGORIES

HE anticipates procurement of the following listed products and services from the following categories of business concerns:

PRODUCTS/SERVICES	LARGE	ALL SMALL BUSINESS CONCERNS				
		SB	SDB	OTHER*	SWOB	HUBZONE
1. Antennas – Tri-cup, UHF, passive microwave components– diplexers, triplexers, multiplexers	X					
2. Star tracker, battery cells, solar array and panels, propulsion, magnetometer, yoke and solar panels,	X					
3. SEM instruments, PLM structures, boom assembly, harnesses, cables, machine parts, optical port covers		X				
4. ADA			X			
5. Hi-Rel Material, switches, solar substrates, fab parts, miscellaneous parts	X	X	X		X	

Legend:

SB = Small Business

SDB = Small Disadvantaged Business

Other\* =

- a) HBCU/MI = Historically Black Colleges and Universities, and Minority Institutions
- b) Veteran Business
- c) Service-Disabled Veteran Business

SWOB = Small Women Owned Business

HUBZone = Historically Underutilized Business Zone

Exhibit 2

SMALL BUSINESS PROGRAMS ADMINISTRATORS

**Boeing Satellite Systems**

**Louise Erickson**  
**Small Business Programs Manager**  
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Los Angeles, CA 90009

Tele: (310)364-6067  
Fax: (310)662-6165  
e-mail: louise.erickson@boeing.com.

**ELECTRON DYNAMICS DIVISION**

**Steve Ellis**  
**Small Business Programs Administrator**  
Bldg. 232, MS 1450  
P.O. Box 2999  
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Tele: (310) 517-5884  
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**SPECTROLAB, INC.**

**Nancy Mason**  
**Small Business Programs Administrator**  
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12500 Gladstone Avenue  
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Attachment K

**PERFORMANCE BASED PAYMENTS**  
**COMPLETION CRITERIA**  
**(Contractor Provided Milestones)**

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January 12, 1998

(Revision A – September 10, 1998)

**GOES O**

O33.	XRS/EUV/EPS/HEPAD Flight Unit#2 (N-O Spares) Pre-Shipment Review	1
O34.	Gate 12 - GOES O S/C to System Test	5
O35.	Gate 13 - GOES O S/C Complete	5
O36.	GOES O End-to-End Test 4 Completed	6
O37.	Gate 7U.5 - GOES O Bus Propulsion Subsystem Complete	5
O38.	Gate 11 - GOES O Antenna to Integration	5
O39.	Gate 12A - Solar Wing to System Test	5
O40.	GOES O Bus Interface Verification Test	6
O41.	GOES O Yoke Electrical Testing	6
O42.	GOES O End-to-End Test 2 Completed	6
O43.	Component & Subsystem Test Data Packages	Document S-415-26 SFAT- 3.3.1-02
OS1.	GOES O Spares Kick-Off Meeting	1
OS2.	Place Order to Panametrics - SEM Instruments	2
OS3.	Place Order for COMDEV Microwave Units	2
OS4.	Place Order for SAAB Deployable Omni Antenna	2
OS5.	Place Order for Ball Star Trackers	2
OS6.	Order Solar Cells & Yoke	2
OS7.	Order Structure Long Lead Parts	2
OS8.	Order LHPs	2
OS9.	Order CCHPs	2
O10.	Receive Yoke Substrate	6
O11.	EP Power Components Complete	6
O12.	Structure Composites Fab Complete	6
O13.	Magnetometer Delivery Complete	6
O14.	Harness Fab Complete	6
O15.	Aft T&C Omni Complete	6
O16.	Battery Fabrication Complete	6
O17.	Receive Solar Cells	6
O18.	Spacecraft Structure Assembly Complete	6
O19.	Panametrics Delivery Complete	6
O20.	Gate 11 - Antenna to Integration	5

**GOES P**

Milestone	Description	Completion Criteria
P29.	Kickoff Meeting	1
P30.	Deliver Launch Services Proposal	3
P31.	Manufacturing Readiness Review	1
P32.	Preliminary Design Review (If req'd)	1
P33.	Transfer SEM instruments from precontractual stores	6
P34.	Communication Subsystem to Integration	6
P35.	T&C Subsystem to Integration	6
P36.	Gate 11 - Antenna to Integration	5
P37.	ACS Subsystem to Integration	6
P38.	Gate 9 - Bus Complete	5
P39.	Bus & SEM Instruments Integration & Test Complete	6
P40.	S/C Unit Integration Complete	6
P41.	SEM Instruments Integration & Test	6
P42.	Gate 12 - S/C to System Test	5
P43.	GFE Integration	6
P44.	Complete EMI/EMC Test	6

**GOES Q**

Milestone	Description	Completion Criteria
Q29.	Kickoff Meeting	1
Q30.	Deliver Launch Services Proposal	3
Q31.	Manufacturing Readiness Review	1
Q32.	Preliminary Design Review (If req'd)	1
Q33.	Transfer SEM instruments from precontractual stores	6
Q34.	Communication Subsystem to Integration	6
Q35.	T&C Subsystem to Integration	6
Q36.	Gate 11 - Antenna to Integration	5
Q37.	ACS Subsystem to Integration	6
Q38.	Gate 9 - Bus Complete	5
Q39.	Bus & SEM Instruments Integration & Test Complete	6
Q40.	S/C Unit Integration Complete	6
Q41.	SEM Instruments Integration & Test	6
Q42.	Gate 12 - S/C to System Test	5
Q43.	GFE Integration	6
Q44.	Complete EMI/EMC Test	6

**ATTACHMENT M**

**GOES N/O SPARES  
OCTOBER 2001**

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GOES "O" SPARES DELIVERABLE LIST

Item No.	Description	Part Number	Spares Qty Req.
<b>EM - Antennas</b>			
1	Tri-Cup Antenna	7998201-100-001	1
2	UHF Antenna	7998204-100-001	1
3	Aft T&C Antenna Assy	7998205-100-001	1
4	Fwd T&C S Band Antenna	7998206-100-001	1
5	Fwd T&C L Band Antenna	7998207-100-001	1
<b>EM - Microwave</b>			
6	3db Hybrids (Dir. Cplr)	4K56-015 CHA	4
7	Coupler 30 db.; dual dir, UHF	4K79-025 CHA	1
8	Coupler 30 db.,Dual-Dir, S-Band	4K79-027 CHA	2
9	CDA Coupler, 8db, Single Dir	4K79-028 CHA	1
10	CMD Coupler - 10 db,Single Dir	4K79-029 CHA	1
11	CMD Coupler - 10 db,Single Dir	4K79-032 CHA	2
12	DSN Coupler, 10W, Single Dir	4K79-033 CHA	1
13	Couplers 30 db, Dual-Dir S-band	4K91-001 CHA	3
14	CT Switch	7967777-002A	4
15	S Switch, Hi-Vib	7982650-001A	6
16	S Switch, Med Pwr, Hi-Vib	7982650-001B	1
17	S Switch, Hi Pwr, Hi-Vib	7982650-002A	2
18	S Switch, Hi Vib; 45W, TNC	7982651-001A	1
19	SAR Output Filter	7999001-001	1
20	S-Band Harmonic Filter	7999002-001	2
21	CDA Output Filter	7999004-001	1
22	T&C Diplexer	7999005-001	1
23	T&C Triplexer	7999006-001	1
24	UHF Diplexer & Harmonic Filter	7999007-001	1
25	S-Band Quadraplexer	7999009-001	1
26	2:3 Switch, Hi-Vib, 20W	8010116-001A	1
27	T&C Harmonic Filter	8023400-001	2
28	2:3 Switch, Hi-Pwr (Dowkey)	8023401-001	1
29	S-Band Triplexer	7999008-001	1
30	T & C Notch	8019389-001	1
31	T & C Notch	8019389-002	1
<b>EM - Propulsion</b>			
32	2 lbf thrusters (LTT)	4947637-001	12
33	Check valve	4947880	2
34	Fill and drain valve	6079061-003	3
35	Fill and drain valve	6079061-004	4
36	Fill and drain valve	6079061-005	3
37	Fill and drain valve	6079058-003	2
38	Fill and drain valve	6079058-005	2
39	Gaseous Helium Filter	260135	1
40	Helium Tanks	4946410	2
41	LAM	4946886-001	1
42	Latch Valves	4946460-001	4
43	Liquid Filter	4946500	2
44	Liquid Filter	4946526	4
45	Pressure Regulator Assy	260101-001	1
46	Pressure Transducer	4945486-001	4

GOES O Spares List\_S Marshall.xls

GOES "O" SPARES DELIVERABLE LIST

Item No.	Description	Part Number	Spares Qty Req.
47	Pressure Transducer	4945486-002	1
48	Propellant Tanks	4947486	4
49	Squib Valve - 1	4946496	2
50	Squib Valve - 2	4946497	2
51	Squib Valve - 3	4946498	4
52	Squib Valve - 4	4946499	1
53	Squib Valve - 5	4946601	2
EM - Solar Array			
54	Solar Panel (Substrate & Cells)	7958489-001	1
55	Yoke Panel (Substrate & Cells)	7958490-001	1
EM - Battery			
56	Battery Top Assembly SE Pack	7998715-100-001	1
57	Battery Top Assembly SW/NE Pack	7998715-100-002	2
EM - Mechanisms			
58	RWA	7998032-100-001	4
59	SAD	7998711-100-001	1
60	SAA	3448760-102-001	1
61	Hinge	3448776-112-004	1
62	ODA	3448715-108	1
63	XRP	7998710-100-001	1
EM - Harness Assy			
64	Payload FWD	7993120-001	1
65	Payload AFT	7993130-001	1
66	Yoke Harness	7993152-001	1
67	Mag Boom Harness	7993190-002	1
68	Bus S&P	7993170-001	1
69	S/C ORD	7993140-001	1
70	Bus Power	7993166-001	1
71	Payload Aft Digital Databus Assy	7993146-001,002	1 ea
72	Bus Digital Databus Assy	7993148-001,002	1 ea
73	FLT Plug Bus	7993184,-185	1 ea
74	FLT Plug Payload	7993176,-178	1 ea
EM - Composites			
75	Cruciform	7992300-001	1
76	Aft Sensor Panel	7992325-001	1
77	Aft Panel East Blank	7992330-001	1
78	Aft Panel West Blank	7992332-001	1
79	Aft East Panel Assy -1,-2,-3 Nested	7992330-001,002,003	1 ea
80	Aft West Panel Assy -1,-2,-3 Nested	7992332-001,002,003	1 ea
81	Fwd E/W Panel Blanks	7992335-001	1
82	Fwd East Panel Assy -2 Nested	7992335-001	1
83	Fwd West Panel Assy nested in -2	7992335-002	1
84	Vertical Shear Panel, Bus Module	7992340-002	1
85	Bus Panel	7992305-001	1
86	Bus[+Y] Radiator Panel	7992321-001	1
87	Payload[-Y] Radiator Panel	7992315-001	1
88	Sub-Nadir Panel	7992310-001	1
89	HIRU Panel - ECR Pending	7992345-001	1
EM - Structures			



GOES "O" SPARES DELIVERABLE LIST

Item No.	Description	Part Number	Spares Qty Req.
90	Bus Module	7998600-100-002	1
91	Payload Module	7998630-100-002	1
92	Loop Heat Pipes	4948835-001	1
93	" "	4948835-002	1
94	" "	4948835-003	1
95	Loop Heat Pipes	4948835-004	1
96	Magnetometer Boom	1008K0000	1
97	Comm, T & C, & Payload Cables	Various P/N's	1 Lot
98	Imager Optical Port Cover Assembly	7992350-001	1
99	Sounder Optical Port Cover Assembly	7992360-001	1
EP - Pwr			
100	BDPU	7998601-100	2
101	Switches ( 1 & 10 Amp)	7998512-100-004	2
102	Switches ( 1 & 10 Amp)	7998512-100-008	1
103	Switches ( 1 & 10 Amp)	7998513-100-008	2
104	Switches ( 1 & 10 Amp)	7998513-101-008	2
105	IPC	7998510-100	1
106	PPDU	7998511-100	1
107	ACE Pwr Supply	7990890	2
108	CTCU Pwr Supply	7990814-001	2
109	IRTCU Pwr Supply	7990814	2
EP			
110	T&C Transponder	7998118-100-001	2
111	MDL/SD Modulator	7998111-100-001	2
112	SAR/DCRP Processor	7998113-100-001	2
113	S-Band Receiver	7998112-100-001	2
114	WEFAX/DCPR Power Amp	7998116-100-001	3
115	PDR Power Amp	7998115-100-001	2
116	Master Oscillator	7998131-100-001	1
117	ECMs	8010240-001	2
118	ECMs	8010245-001	2
119	ECMs	8010245-002	6
EP			
120	ACE w/ Prom Module	7998702-100-001	2
121	IRTCU	7998302-100-001	2
122	CTCU	7998301-100-001	2
123	SDU	3448321-121-001	1
124	Star Tracker	7998701-100-001	3
125	HIRU	3448730-119-003	1
126	TOES	7998730-100-001	2
127	PSS	7998709-100-001	1
128	TOSS	7998721-100-001	1
129	ACSS	7998732-100-001	2
130	KSS	7998731-100-001	1
131	KSS	7998731-100-002	2
132	ADS	7998707-100-001	1
133	ADS	7998707-100-002	1
SEM Instruments			
134	Magnetometer Electronics	7998014-100-001	2

GOES "O" SPARES DELIVERABLE LIS

Item No.	Description	Part Number	Spares Qty Req.
135	Magnetometer Sensors	7998015-100-001	2
136	XRS/EUV	7998016-100-001	1
137	HEPAD	7998020-100-001	1
138	MAGED	7998021-100-001	1
139	MAGPD	7998022-100-001	1
140	EPEAD	7998023-100-001	1
141	EPEAD	7998023-100-001	1
142	EPS/HEPAD DPU	7998024-100-001	1

**ATTACHMENT N**

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**PERFORMANCE BASED PAYMENTS FOR  
CLAUSE H.24**

**October 2001**

GOES P

Spacecraft System Level Reviews

P1.	RESERVED		
P2.	Mission Operations Review	\$4,200,000	4/5/04
P3.	Pre-Environmental Review	\$4,000,000	2/15/04
P4.	Pre-Shipment Review	\$4,000,000	1/15/05
P5.	Flight Operations Review	\$4,000,000	1/12/05
P6.	Spacecraft Launch Readiness Review	\$4,900,000	3/15/05

Software Subsystem Reviews

P7.	RESERVED		
P8.	Test Readiness Review	\$4,100,000	9/17/03
P9.	RESERVED		

Launch Services

P10.	Launch Vehicle Interface Requirements Document	\$4,000,000	11/28/03
P11.	Spacecraft/Launch Vehicle Interface Control Document	\$4,000,000	1/5/04
P12.	RESERVED		
P13.	Final Loads Verification Review	\$5,200,000	8/1/04
P14.	RESERVED		
P15.	Launch Vehicle Pre-Installation Review (Major Components)	\$4,200,000	7/1/04
P16.	Launch Vehicle Design Certification Review	\$5,000,000	12/1/04
P17.	Launch Vehicle Pre-Ship Review	\$5,100,000	10/19/04
P18.	Booster on Stand (BOS) Review	\$4,000,000	2/4/05

P19.	Pre-Payload Mate Review	\$2,000,000	3/17/05
P20.	Launch Vehicle Mission Peculiar/ Mission Unique Preliminary Design Review	\$3,300,000	8/1/03
P21.	Launch Vehicle Mission Peculiar/ Mission Unique Critical Design Review	\$4,200,000	2/1/04
P22.	Launch Vehicle Component/ System Design Review (Major Mods only) (PDR Level)	\$5,300,000	8/1/03

P23.	Launch Vehicle Component/ System Design Review (Major Mods only) (CDR Level)	\$4,200,000	3/1/04
P24.	External Independent Readiness Review	\$5,000,000	1/10/05
P25.	Senior NASA Management Mission Readiness Review	\$2,000,000	3/8/05
P26.	Launch Readiness Review	\$4,000,000	3/22/05

#### System Events

P27.	Spacecraft Engineering Handover	\$4,100,000	4/30/05
P28.	Final On-orbit Acceptance	\$6,100,000	9/28/05

#### Contractor Defined Milestones

P29.	Kickoff Meeting	\$4,900,000	5/1/03
P30.	Deliver Launch Services Proposal	\$4,900,000	5/1/03
P31.	Manufacturing Readiness Review	\$5,000,000	8/15/03
P32.	RESERVED		
P33.	RESERVED		
P34.	RESERVED		
P35.	T&C Subsystem to Integration	\$4,100,000	6/14/03

P36. RESERVED

P37. ACS Subsystem to Integration \$5,300,000 8/16/03

P38. Gate 9 - Bus Module Complete \$4,100,000 9/1/03

P39. Bus & SEM Instruments Integration  
& Test Complete \$4,100,000 12/30/03

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P40. RESERVED

P41. RESERVED

P42. Gate 12 - S/C to System Test \$4,200,000 12/15/03

P43. GFE Integration \$3,700,000 12/15/03

P44. Complete EMI/EMC Test \$4,200,000 6/15/04

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 2

2. AMENDMENT/MODIFICATION NO.

Sixty (60)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

N: 415-52948A(1C) JON: 415-616-41-81-11 BLI: A701 OC: 41-2550 APP: 802/30110(02) AMT: \$0 PPC: BX B/NC: 427

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:  
52.245-2 Government Property

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the firm fixed price of the contract by \$3,492 for repairs to the Solar X-Ray Imager telescope.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

J.T. Felicita  
(Signature of person authorized to sign)

12/05/01

BY Sandra Marshall  
(Signature of Contracting Officer)

12/7/01

1. In Clause B.1 DELIVERABLE REQUIREMENTS increase Contract Line Item number 1. by \$3,492 to reflect the following:

<u>CLIN</u>	<u>Description</u>	<u>Price</u>
1.	On-Orbit Acceptance of GOES N Spacecraft	\$312,982,031

2. Increase Clause B.2 FIRM FIXED PRICE as follows:

<u>From</u>	<u>By</u>	<u>To</u>
\$511,460,104	\$3,492	\$511,463,596

3. In Clause B.5 EVENTS FOR PERFORMANCE BASED PAYMENTS, add the following event for GOES N:

N93.	SXI Mass Model Repair	\$3,492	11/09/01
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4. In Clause J.1 LIST OF ATTACHMENTS, make the following change:

Attachment K, Performance Based Payments Completion Criteria

Add N93, SXI Mass Model Repair with a completion criteria of 6.

5. Replace the contract areas listed below with the enclosed revised pages:

Contract  
Page 4  
Page 6  
Page 16

Attachment K, Performance Based Payments Completion Criteria  
Title Page  
Page 4

In consideration of the modification(s) agreed to herein as a complete equitable adjustment for the effort associated with the Contracting Officer's letter dated March 16, 2001 and Boeing's electronic submission, dated June 8, 2001, the Contractor hereby releases the Government from any and all liability under this contract for further equitable adjustments attributable to such facts or circumstances giving rise by this action.

END OF MODIFICATION



**SECTION B OF NAS5-98069  
MODIFICATION NO. 60  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.1 DELIVERABLE REQUIREMENTS (GSFC 52.210-90) (OCT 1988)**

The Contractor shall perform and/or deliver the following:

Contract Line  
Item Number  
(CLIN)

Description

Price

1.	On-Orbit Acceptance of GOES N Spacecraft	\$312,982,031
2.	Propulsion Computer Model & Supporting Documentation	NSP
3.	a. Software Development & Validation Environment b. GTACS Workstation for SXI T&C, I&V and Software Development	NSP
4.	Source & Executable Flight Software Code	NSP
5.	Emulators w/Spare Parts S/C Emulator (2) 3 sets EACE components (1 set includes EACE board, EACE DPM daughter card, EACE PAM board; 3 sets ETC components (1 set includes ETC board and PAM board; 2 special order ovenized oscillators used by EACE	NSP
6.	INR Performance Evaluation System	NSP
7.	SXI to Spacecraft Harness	NSP
8.	Battery Test Cells (5 from each activation lot)	NSP
9.	Data for Communication Modeling Engineering Model Data Flight Model Data	NSP
10.	Acceptance of SSGS	NSP

**SECTION B OF NAS5-98069  
MODIFICATION NO. 60  
SUPPLIES OR SERVICES AND PRICES/COSTS**

**B.2 FIRM FIXED PRICE (18-52.216-78) (DEC 1988)**

The total firm fixed price for this contract is \$511,463,596.

(End of clause)

**B.3 RESERVED**

**B.4 PERFORMANCE-BASED PAYMENTS (52.232-32) (MAY 1997)**

(a) Amount of payments and limitations on payments. Subject to such other limitations and conditions as are specified in this contract and this clause, the amount of payments and limitations on payments shall be specified in the contract's description of the basis for payment.

(b) Contractor request for performance-based payment. The Contractor may submit requests for payment of performance-based payments not more frequently than monthly, in a form and manner acceptable to the Contracting Officer. Unless otherwise authorized by the Contracting Officer, all performance-based payments in any period for which payment is being requested shall be included in a single request, appropriately itemized and totaled. The Contractor's request shall contain the information and certification detailed in paragraphs (l) and (m) of this clause.

(c) Approval and payment of requests. (1) The Contractor shall not be entitled to payment of a request for performance-based payment prior to successful accomplishment of the event or performance criterion for which payment is requested. The Contracting Officer shall determine whether the event or performance criterion for which payment is requested has been successfully accomplished in accordance with the terms of the contract. The Contracting Officer may, at any time, require the Contractor to substantiate the successful performance of any event or performance criterion which has been or is represented as being payable.

(2) A payment under this performance-based payment clause is a contract financing payment under the Prompt Payment clause of this contract, and approved requests shall be paid in accordance with the prompt payment period and provisions specified for contract financing payments by that clause. However, if the Contracting Officer requires substantiation as provided in paragraph (c)(1) of this clause, or inquires into the status of an event or performance criterion, or into any of the conditions listed in paragraph (e) of this clause, or into the Contractor certification, payment is not required, and the prompt payment period shall not begin until the Contracting Officer approves the request.

(3) The approval by the Contracting Officer of a request for performance-based payment does not constitute an acceptance by the Government and does not excuse the Contractor from

**SECTION B OF NAS5-98069  
MODIFICATION NO. 60  
SUPPLIES OR SERVICES AND PRICES/COSTS**

N80.	HSE Delivery to ITT for RTP Checkout	\$3,100,000	11/01/00
N81.	Red Team Kick-off Review	\$8,000,000	2/15/01
N82.	GOES N Solar Array Power Test	\$8,000,000	3/15/01
N83.	System Verification Review	\$7,000,000	3/15/01
N84.	GRODAS Implementation	\$1,000,000	4/15/01
N85.	Phase I SSGS Training	\$1,362,529	6/15/01
N86.	Solar Thermal Balance Test of Solar Array Yoke	\$3,000,000	6/15/01
N87.	EDDS Upgrade Acceptance	\$1,000,000	6/15/01
N88.	Completion of Spare Comm Boxes	\$1,021,539	9/14/01
N89.	Delivery of SSGS Mods	\$1,000,000	11/15/01
N90.	HSE Acceptance	\$1,000,000	1/15/02
N91.	Delivery of INR Analytical Tools	\$500,000	5/15/02
N92.	GRODAS Data Flow Demonstration	\$4,000,000	8/01/01
N93.	SXI Mass Model Repair	\$3,492	11/09/01

**GOES O**

**Spacecraft System Level Reviews**

O1.	Critical Design Review	\$2,000,000	2/11/00
O2.	Mission Operations Review	\$8,100,000	4/2/02
O3.	Pre-Environmental Review	\$6,700,000	4/18/02
O4.	Pre-Storage Review	\$12,000,000	12/11/02
O4A.	Pre-Shipment Review	\$500,000	12/11/03
O5.	Flight Operations Review	\$1,000,000	1/9/04
O6.	Spacecraft Launch Readiness Review	\$500,000	4/4/04

Attachment K

**PERFORMANCE BASED PAYMENTS**  
**COMPLETION CRITERIA**  
**(Contractor Provided Milestones)**

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January 12, 1998

(Revision A – September 10, 1998)

**GOES N**

N64.	INR System Description and Analysis Document (Final)	3
N65.	Contingency Simulation # 1	6
N66.	Dress Rehearsal	6
N67.	GOES N Data Book	6
N68.	GOES N End-to-End Test 4 Completed	6
N69.	Algorithm Design Description – Build 3	6
N70.	1553 Data Bus Diagnostics Features Meeting	6
N71.	PES ADD Walk-Thru Review	1
N72.	PES Prototype GUI Demo	6
N73.	PES Delivery	4
N74.	Wideband Tape Recorder Delivery & Training	6
N75.	Safehold Mode Proposal	6
N76.	Electronic Data Distribution System & Configuration Management Review	1
N77.	Rebaseline Schedule Review	1
N78.	Integration and Test (I&T) Review	1
N79.	1 <sup>st</sup> Powered Testing of GOES N Bus Module	6
N80.	HSE Delivery to ITT for RTP Checkout	6
N81.	Red Team Kick-off Review	1
N82.	GOES N Solar Array Power Test	6
N83.	System Verification Review	1
N84.	GRODAS Implementation	6
N85.	Phase I SSGS Training	6
N86.	Solar Thermal Balance Test of Solar Array Yoke	6
N87.	EDDS Upgrade Acceptance	6
N88.	Completion of Spare Comm Boxes	6
N89.	Delivery of SSGS Mods	6
N90.	HSE Acceptance	4
N91.	Delivery of Analytical Tools	6
N92.	GRODAS Data Flow Demonstration	6
N93.	SXI Mass Model Repair	6

**GOES O**

Milestone	Description	Completion Criteria
O29.	Gate 7 - Start Bus Integration	5
O30.	Gate 9 - Bus Complete	5
O31.	Gate 10 - Payload Complete	5
O32.	Bus & SEM Instruments Integration & Test Complete	6

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT1. CONTRACT ID CODE  
N/APAGE OF  
1 22. AMENDMENT/MODIFICATION NO.  
Sixty-One (61)3. EFFECTIVE DATE  
See Block 16C4. REQUISITION/PURCHASE REQ. NO.  
See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY CODE  
NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 200717. ADMINISTERED BY (If other than Item 6) CODE  
NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE	FACILITY CODE
(X) 9A. AMENDMENT OF SOLICITATION NO.	9B. DATED (SEE ITEM 11)
X 10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

C: BX B/NC: 427 See Page 2

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	d. OTHER (Specify type of modification and authority) Unilateral Modification; Clause H.6 LIMITATION OF FUNDS

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$20,000,000 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

BY

(Signature of person authorized to sign)

(Signature of Contracting Officer)

7540-01-152-8070

30-105

STANDARD FORM 30 (Rev. 10-83)

PREVIOUS EDITION UNUSABLE

Prescribed by GSA

1. In Clause H.6, increase the funding from \$343,828,313 by \$20,000,000 to \$363,828,313. The period of allotment is from the effective date of the contract through April 30, 2002 in accordance with the contractor's correspondence dated January 10, 2002.

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2. Block 12 Accounting and Appropriation Data:

PCN: 415-52954A(1C)  
JON: 415-616-41-81-11  
APP: 802/30110(02)  
BLI: A703  
OC: 41-2550  
AMT: \$20,000,000

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 61  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on a semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$363,828,313 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:



**SECTION H OF NAS5-98069  
MODIFICATION NO. 61  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until April 30, 2002.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 6

2. AMENDMENT/MODIFICATION NO.

Sixty-Two (62)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMA Boeing Space and Communications Seal  
Beach

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE	FACILITY CODE
(X) 9A. AMENDMENT OF SOLICITATION NO.	9B. DATED (SEE ITEM 11)
X 10A. MODIFICATION OF CONTRACT/ORDER NO. NAS5-98069	10B. DATED (SEE ITEM 13) 01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

BX B/NC: 427 N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.  
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(X)

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: Clause 52.243-1 Changes Fixed Price—Alt. II
	d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4235C, 4255A, 4263B, 4265, 4266, 4268, 4275, 6041D, 6080, 6127, 6130, 6139, 6140, 6147B, 6152, 6172, 6173, 6178, 6179, 6185D, 6187, 6188, 7045B and 8048 at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

J.T. Felicita  
(Signature of person authorized to sign)

3/18/02

BY Sandra Marshall  
(Signature of Contracting Officer)

3/21/02

NSN 7540-01-152-8070

30-105

PREVIOUS EDITION UNUSABLE

STANDARD FORM 30 (Rev. 10-83)

Prescribed by GSA

**1. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment A, Statement of Work

Delete 3.6.2.1.2 GN Compatibility Testing and Data Flows. (CCR 4265)

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Clarify 3.3.8.6 to show that the T&C RF antenna system pattern will be derived from measurement and modeling as reflected in CCR 6080.

Attachment B, Performance Specification

In 9.1.4.3, change the HEPAD geometric factor to  $>0.7 \text{ cm}^2\text{-sr}$ . (CCR 4268)

Change 7.1.1, 7.1.6, 7.2.1 (18.d.3), 7.2.1 (20.d), and 7.2.4 (3) to reflect older requirements not applicable to the N-Q system as reflected in CCR 6041D.

Modify 8.4.6.2, 8.4.6.3 and 8.4.6.4 to align CS03, CS04 and CS05 test limits with GOES specific performance requirements and test methods as specified in CCR 6152.

In section 2.0 modify the applicable document, Interface Control Document for Imager and Sounder Test Equipment and the N-Q Spacecraft Ground Support Equipment/Facilities and Spacecraft Launch Facilities, section 6.3.5, to correct the WFC storage requirements as reflected in CCR 6172.

Modify 8.5.3.5 and 10.5.4.1 to reflect the solar array thermal vacuum test and hot LAPSS requirements as specified in CCR 6173.

Attachment B, Performance Specification, Appendix A, Deviation and Waiver Requests

In 10.11.3 waive the outgassing requirements that would allow usage of silicone base damping fluid as specified in CCR 6130.

In 10.11.3 waive the outgassing requirements that would allow usage of 3M #486 tape in the magnetometer as specified in CCR 6139.

In 10.11.3 waive the outgassing requirements that would allow usage of 3M #92 tape in the thrusters as specified in CCR 6140.

In 10.11.3 waive the outgassing requirements that would allow usage of designated materials for the latch valve as specified in CCR 6178.

In 10.11.3 waive the outgassing requirements that would allow usage of Loctite Speedbond 325 adhesive used in the helium tank as specified in CCR 6179.

In 8.4 waive the XRP EMI/EMC testing on the engineering model as specified in CCR 6187.

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In 8.5.3.2 (1.b) waive the cold thermal limit for the magnetometer sensor as specified in CCR 6188.

Attachment C, GOES N-Q Imager Interface Control Document

Change 3.6.1.4 to reflect the changed purge requirements for ground based integration and test operations from delivery to launch base operations as reflected in CCR 4255A.

In table 3.2.2-1 waive the baseplate loads and moments requirements specified in CCR 6185D.

In figures 3.2.4-1, 3.2.4-3, 3.5.1-2, 3.5.1-4, 3.5.4-1 and tables 3.2.4-1, 5.1.6-1 and 5.4-1 add the blackbody dwell modifications and clarify other items as specified in CCR 7045B.

Attachment D, N-Q Sounder Instrument Interface Control Document

Change 3.6.1.4 to reflect the changed purge requirements for ground based integration and test operations from delivery to launch base operations as reflected in CCR 4255A.

In table 3.2.2-1 waive the baseplate loads and moments requirements specified in CCR 6185D.

In figures 3.2.4-1, 3.5.1-4, 3.5.4-1, 3.5.4-12 and tables 3.2.4-1, 3.5.4-12, 5.1.4-1 and 3.5.3-3 add the blackbody dwell modifications and clarify other items as specified in CCR 7045B.

Attachment E, Interface Control Document for the Solar X-Ray Imager (SXI)

Change 3.4.4.1.5-2, 3.4.4.1.5-3, 3.4.4.1.5-4, 3.4.4.1.5-5, 3.4.4.1.5-6, 3.4.4.1.5-7 and add 3.4.4.1.5-8, 3.4.4.1.5-9 and 3.4.4.1.5-10 to reflect the purge requirements for ground based integration and test operations from delivery to launch base operations specified in CCR 4235C.

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Add 3.3.1.2.3, 3.3.1.2.3-1, 3.3.1.2.3-2 and table 3.3.1-1 to reflect serial and part numbers for the various SXI models specified in CCR 4263B.

Revise tables 3-13 and 3-25 to clarify the survival temperature sensors requirement as reflected in CCR 4266.

In 3.4.4.1.1-3, 3.4.4.1.1-4 and 3.4.4.1.5-1, change the approval authority from the SXI contractor to the Government. (CCR 4275)

Revise 3.4.1.3.8, 3.4.1.3.8-1, 3.4.1.3.8-2, 3.4.1.3.8-3 and figure 3.4.1.3.8-1 to clarify the disturbance torque reflected in CCR 6127.

Attachment G, Contract Document Requirements List

Revise DID SDA 3.2.8-02, paragraph 5, item g, to indicate that the T&C RF antenna system data will be generated from a model as reflected in CCR 6080.

Attachment L, Interface Control Document for the SXI Ground Support Equipment

Revise 2.2.1, 2.3, 3.3.1.1-1, 3.3.1.1.1-1, 3.3.1.1.1-3, 3.4-1, 3.4-4, 3.4-5, 3.4-6, 3.4.3-1, 3.4.4-2 to change the SXI document numbers to ISI document numbers for ISI's Programmer Reference Manual as reflected in CCR 6147B.

Revise 3.12-1 to reflect that the mass model was not designed to undergo environmental testing as stated in CCR 8048.

**2. Replace the contract areas listed below with the enclosed revised pages:**

Attachment A, Statement of Work

Cover Page  
Section 3.3.8.6  
Section 3.6.2.1.2

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Attachment B, Performance Specification

Cover Page  
Section 7.1.1  
Section 7.1.6  
Section 7.2.1 (7-17)  
Section 7.2.1 (18)  
Section 7.2.1 (20)  
Section 7.2.4  
Section 8.4.1  
Section 8.4.6.2  
Section 8.4.6.3  
Section 8.4.6.4  
Section 8.5.3.2  
Section 8.5.3.5  
Section 9.1.4.3  
Section 10.5.4.1  
Section 10.11.3

Attachment B, Performance Specification, Appendix A

Add new page

Attachment G, Contract Document Requirements List

Cover page  
SDA-3.2.8-02, item 5. f and g

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The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

**\* UPDATED TO MODIFICATION 62 \***

**ATTACHMENT A**

**S-415-23**

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**STATEMENT OF WORK**

**FOR**

**THE GEOSTATIONARY OPERATIONAL  
ENVIRONMENTAL SATELLITE**

**GOES-N,O,P,Q**

**AUGUST 26, 1997**

**NASA/GODDARD SPACE FLIGHT CENTER  
GREENBELT, MARYLAND 20771**



Coherent	Unmodulated carrier, ranging ON, -50 dBc, 1.5 MHz
CDA Telemetry Transmitter	Unmodulated carrier, -50 dBc, 30 kHz

Table 3.3.8.4.1-2

## Spurious Emissions - Other Channel Configuration Requirements

Channel Designation	Spurious Requirement - Other Channel Configuration
Sensor Data	Modulated with Pseudo Noise (PN) sequence, NRZ-S, OQPSK
PDR	Modulated with PN sequence, NRZ-S, 2.11 Mbps BPSK
WEFAX	Modulated with PN sequence, NRZ-M, 293 kbps BPSK
EMWIN	Modulated with PN sequence, NRZ-M, 25 kbps BPSK
DCPI	DCPI modulated signal
DCPR	See Section 3.3.8.4.2, below
SAR	No uplink
MDL	Modulated with PN sequence, 400 kbps, QPSK
Command Receiver	Coherent mode
DSN Telemetry	Modulated with data, coherent mode, ranging ON
CDA Telemetry	Modulated with data

**3.3.8.4.2 DCPR Spurious Emission Test**

The spacecraft contractor shall demonstrate that spurious emissions meet the specified requirements of S-415-22, section 10.2 for the DCPR channel, by performing a noise power ratio test for each channel on each spacecraft at any verification test level. After demonstrating compliance with the noise power ratio test, the contractor may elect to use a two-signal linearity test at any level of integration.

A two signal test shall use two equal input power sinusoids (carriers), such that the total power is equal to the dynamic range maximum and the two sinusoids are separated in frequency by 2 kHz. Any resulting intermodulation products shall not be greater than 25 dB below the power in one tone.

**3.3.8.5 Interference Testing**

The spacecraft contractor shall perform worst-case interference testing for the 1670 to 1695 MHz downlinks. Each transmission channel under test shall be tested at the dynamic range maximum, with any other adjacent channel modulated signals present at their dynamic range maximum.

**3.3.8.6 Antenna Pattern Measurements**

Coverage and polarization measurements shall be performed at an appropriate antenna test facility sufficient to accurately determine the radiation pattern and phase, where appropriate, of each spacecraft antenna. Composite coverage and polarization patterns for the T&C antenna system, made up of more than one discrete radiating element, shall be provided as detailed in CDRL SDA-3.2.8-02. The tabulated antenna data shall be delivered to NASA in a standard electronic format. Refer to CDRL SDA-3.2.8-02. (MOD 62, CCR6080)

The spacecraft contractor shall provide all personnel, services, and materials required to review a variety of operations-related documentation. These shall include, but not be limited to, operations scripts, spacecraft command procedures, contingency operations procedures, and operations handbooks.

### **3.6.2 Pre-launch Support (PREL)**

#### **3.6.2.1 Network Compatibility Testing and Data Flows**

The spacecraft contractor shall provide all personnel services and materials required to assure compatibility with all segments of any ground systems to be used throughout the mission, as described below.

##### **3.6.2.1.1 In-plant Compatibility Testing**

Testing of the GOES-N spacecraft shall be conducted with a government-provided ground network (GN) compatibility test suite during spacecraft functional testing prior to spacecraft-level environmental testing. Testing with GOES-O,P,Q shall be required if changes are made to the telemetry and command systems of these spacecraft.

##### **3.6.2.1.2 Deleted (MOD 62, CCR4265)**

##### **3.6.2.1.3 Launch Base Compatibility Testing**

The spacecraft contractor shall provide all personnel services, and materials required to support a series of network compatibility tests in preparation for the final spacecraft end-to-end (ETE) testing defined in section 3.6.2.3.2.5. These network tests are intended to incrementally verify components of the network that will be used to support command and telemetry data flow between the spacecraft and government operations center. The spacecraft contractor shall provide test time for the spacecraft while located at the appropriate launch base facility.

**\*Updated to Modification 62\***

**ATTACHMENT B**

**S-415-22**

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**PERFORMANCE SPECIFICATION**

**FOR THE**

**GEOSTATIONARY OPERATIONAL ENVIRONMENTAL  
SATELLITE**

**GOES-N,O,P,Q**

**AUGUST 26, 1997**

**NASA/GODDARD SPACE FLIGHT CENTER  
GREENBELT, MARYLAND 20771**

## 7.0 SPACECRAFT SUPPORT GROUND SYSTEM

### 7.1 General Requirements

The spacecraft contractor shall provide a ground system to support the requirements of the as-built GOES N-Q spacecraft. The GOES N-Q SSGS shall provide, as a minimum, the functionality of the GOES I-M SSGS (i.e., OATS, MDL Processing System (MPS), Dynamic Interaction Diagnostic (DID), GIMTACS, TACTS, PM, SPS), but is not constrained to use the same architecture. All GOES N-Q SSGS elements shall use a common time reference to permit accurate time correlation of data between elements.

Considering the potential to minimize floor/desktop space requirements and minimize operator training, the spacecraft contractor shall, if feasible, use, adapt, modify, or upgrade GOES I-M SSGS elements for use in the GOES N-Q SSGS, as stipulated in the remainder of this section, and provide new elements where reuse is not feasible. Where GOES I-M SSGS elements are reused for GOES N-Q, backward compatibility of GOES N-Q software is not required; rather, what is required is that workstations and processors be configurable by menu selection to load and start up either GOES N-Q or any other software at boot-up. Note: GOES I-M SSGS software will be made available as GFE; and no GOES I-M SSGS hardware will be provided as GFE, but access to this hardware will be made available by the government for test and integration purposes; and 3) the capabilities of the GOES I-M SSGS must not be degraded by the introduction of the GOES N-Q SSGS hardware or software into the SOCC and CDAS environments.

**7.1.1 GOES N-Q Telemetry and Command System (GTACS)** - The spacecraft contractor shall provide a telemetry and command processing system (GTACS) to support the as-built GOES N-Q spacecraft. The GTACS shall provide, as a minimum, the system functional capabilities and an equivalent level of operability and performance as specified in the GOES I-M Telemetry and Command System (GIMTACS) Functional Specification (dated 22 February, 1988) and the NOAA Workstation Consolidation Common Engineering Analysis System Requirements, August 4, 1998, Final, Mitretek, Systems. (MOD 62, CCR6041D)

Currently, VAX 3100 workstations are capable of being booted up to run either GIMTACS or Polar Acquisition and Command System (PACS) software, allowing the same workstations to support launch and engineering activities for both programs. These workstations will also be used to support the Integrated PACS (IPACS) system when the US Air Force Defense Meteorological Satellite Program (DMSP) operations are transferred to NOAA. Design work is ongoing for replacement GIMTACS/PACS workstations, with a hardware solution expected in the fourth quarter of 1997. Because of the multiple system usage and to avoid hardware duplication, these replacement workstations shall be used for GOES N-Q support. Adequate resource margin requirements will be imposed on the replacement workstations to support expected GTACS requirements and alternative operating system environments (e.g., VMS and UNIX). Workstation replacement documentation will be distributed as it becomes available.

**7.1.2 GOES N-Q Telemetry Acquisition and Command Transmission System (NTACTS)** - The spacecraft contractor shall provide new Telemetry Acquisition and Command Transmission Systems (TACTSs) capable of supporting the as-built GOES N-Q spacecraft. These new GOES N-Q TACTS (NTACTS) shall retain the system functional capabilities and equivalent level of operability and performance specified in the TACTS Overview and Configuration Manual; Version 3.1 (dated April 1991), the TACTS Interface Definition Document, Version 2.0 (dated March 1989), and the TACTS Operator Manual, Version 2.0 (dated February 20, 1991). An exception to the above requirements is that the NTACTS does not require the current capabilities of displaying spacecraft telemetry and generating commands to the spacecraft, as currently provided in the GOES I-M TACTS.

**7.1.3 Sensor Processing System (SPS)** - The SPS consists of Image Processing Systems (IPSs) that process the raw instrument data and analyst workstations used for calibration and engineering analysis. There are four IPSs at the Wallops CDAS with one planned for the backup CDAS. There are three analyst workstations at the SOCC, two at the Wallops CDAS, and one is planned for the backup CDAS. The existing SPSs shall be used to process the raw GOES N-Q Imager and Sounder data, generate the GVAR formatted data stream, and perform instrument calibration and analysis. Any spacecraft contractor changes to the SPS functionality or interfaces, in particular the changes required by the yaw flip, shall be the responsibility of the spacecraft contractor and will require approval by NASA. The GVAR format shall not be modified, unless it can be guaranteed that users who do not choose to modify their GVAR ingest systems will still be able to receive all the data in the current GVAR. The government will provide the spacecraft contractor access to an SPS for test, integration, and validation purposes. The OGE Interface Specification, DRL 504-02 and the SPS User's and Software Maintenance Manuals describe the SPS architecture, capabilities, and interfaces.

**7.1.4 Product Monitor (PM)** - The spacecraft contractor shall utilize the as-built GOES I-M PMs for the monitoring and analysis of GOES N-Q GVAR data and to obtain landmark data. Currently, there are four PMs at SOCC, three at the Wallops CDAS, and one is planned for the backup CDAS. Replacement PMs are currently under procurement, with initial delivery expected in the first quarter of 1999. For the purposes of this request for proposal, the existing PM interface specifications given in the OGE Interface Specification, DRL 504-02 should be used. Any spacecraft contractor changes to the PM functionality or interfaces, as specified in the OGE Interface Specification and the PM User's and Software Maintenance Manuals, shall be the responsibility of the spacecraft contractor and shall require NASA approval. The government will provide the spacecraft contractor access to a PM for test, integration and validation purposes.

**7.1.5 Orbit and Attitude Tracking System (OATS)** - The spacecraft contractor shall provide an orbit and attitude determination (OAD) system for the as built GOES N-Q spacecraft with, as a minimum, the functionality and operability of the GOES I-M OATS, as described in the OGE Interface Specification, and the OATS User's and Software Maintenance Manuals. If feasible, the existing GOES I-M OATS Digital Equipment Corporation (DEC) Alpha workstations shall be used for the GOES N-Q OATS.

**7.1.6 MDL Receive System, MPS, and MPS Server** - The GOES I-M MPS is an extension of the existing Sun workstation-based DID and SPS analyst workstation capability currently under development by NOAA contractors to support the GOES-M SXI in addition to the GOES-8 and GOES-10 MDL. As defined in the GOES I-M documentation, the MPS includes servers, DID and SXI telemetry handling, and the DID and SXI analysis capabilities. Because of the expected redesign of the MDL receive system and changes to the MDL data streams, the GOES N-Q MPS comprises only the data handling/analysis process that will run on the existing Sun analyst workstations. The DID, MPS server, and receive system functions are identified as separate components. See the SPS and DID Hardware, Software and User's Manuals, and the OGE Interface Specification for a description of the DID and SPS analyst workstation capabilities and interfaces, and the DID archive design.

The spacecraft contractor shall provide a new GOES N-Q MDL receive system and MPS server to demodulate, bit synchronize, provide SXI instrument housekeeping telemetry exchange with GTACS, and archive the GOES N-Q spacecraft MDL and SXI data streams described in section 10.2, and the SXI ICD. The spacecraft contractor shall have the option to either design the MPS server function to interface with the GOES I-M MPS analyst workstation capability currently under development, or to develop a GOES N-Q MPS analysis function compatible with the GOES N-Q MPS server capable of running on the existing analysis workstations. The spacecraft contractor shall also provide a GOES N-Q DID function to process the GOES N-Q MDL attitude data. The GOES N-Q DID shall be integrated into the existing SOCC SPS/MPS analyst workstations. (MOD 62, CCR6041D)

7. Process telemetry and distribute to operator workstations within 0.5 seconds of its receipt at the control center, distributing telemetry updates at the same rate as telemetry blocks/minor frames are received from the spacecraft.
8. Process and output clear mode and encrypted commands at the maximum allowable rate of the as-built N-Q spacecraft command receivers, outputting commands issued by a commanding workstation within one telemetry block/minor frame update period.
9. Support the scheduling, commanding, and telemetry processing requirements of the yaw flip maneuver.
10. Fail over to redundant systems within one minute; in the case of failure of an operator position commanding a spacecraft, switchover of any non-command mode operator position to command mode within 15 seconds of operator initiation of the action.
11. ~~Support up to 100 user workstations, each capable of performing real-time commanding and telemetry monitoring, spacecraft operations scheduling, and off-line telemetry analysis functions.~~
12. Provide sufficient capacity to support telemetry and command processing for eight real and simulated GOES N-Q spacecraft concurrently.
13. Provide processing system resource margins of 50% (e.g., CPU speed, RAM and disk capacities) for every component (excluding the GIMTACS operator workstations) when supporting three fully operational spacecraft configurations and using the full capabilities of all components (the spacecraft contractor can assume the GIMTACS/PACS replacement workstations will have this capacity). GTACS components shall have this resource margin at final delivery before the GOES-N launch.
14. Provide redundancy such that no single point of failure, workstation outage, or system performance degradation in the GTACS will disrupt or preclude real-time telemetry and command processing operations.
15. Use the GOES I-M Archive System for the on-line storage of the GOES N-Q DSN and CDA (2209 MHz and 1694 MHz) PCM telemetry streams, NTAacts AGC data, Imager and Sounder wideband telemetry received from the SPS, and SXI data received from the MRS&S. The interface between GTACS and the GOES I-M archive system shall be implemented in accordance with ISO GOES Archive - GAIM Interface Control Document, ISI-NQ-GTACS-0006. (MOD36, CCR4183C, MOD43, CCR4215)
16. Provide an SSGS configuration monitoring function to monitor the status and send configuration commands to all GOES N-Q SSGS component systems, similar to the GIMTACS configuration page.
17. Provide an operator workstation function meeting the following general requirements (and design goals, given that reuse of the replacement GIMTACS workstations is required):
  - a. Windows-based graphical user interface (GUI).
  - b. Startup of GOES N-Q software from completion of operating system boot-up in one minute or less. (MOD49, CCR4226C)
  - c. Minimum of 20 active windows to include plots, telemetry display pages. (MOD49, CCR4226C)
  - d. Resizable windows minimizable to an icon, with selectable font sizes to permit zooming and full page width views of open windows.
  - e. Deleted (MOD49, CCR4226C)
  - f. Hard copy page snap capability for any active window.
  - g. On-line, context sensitive help and an on-line copy of the user's manual.
  - h. User input & response logging.
  - i. Text messaging capability to address any connected GTACS, SPS, PM, or GOES N-Q OATS workstation. For those systems, such as the PM, without this capability, the spacecraft contractor shall define the message structure.
  - j. Text file output to local & system printer.
  - k. Workstation hard disk space warning alert program.
  - l. Visual and audible alarm upon loss of a telemetry stream being monitored.

18. Provide the following specific real-time operator/engineer (Ops/Eng) workstation capabilities:
  - a. Real-time spacecraft commanding restricted to one workstation per spacecraft at any one time.
  - b. Command authority takeover by any workstation signed on to that same spacecraft within 30 seconds, with notification sent to all other workstations monitoring the spacecraft.
  - c. Monitoring the telemetry and command activities of a minimum of three spacecraft concurrently while in command mode.
  - d. Up to 10 simultaneous real- and non-real-time plots, each displaying up to four mnemonics, with the following characteristics:
    1. Non-real-time (archive data) plots to screen limited to one-hour of data
    2. Continuously scrolling real-time plots (i.e., not time limited)
    3. Plot widths definable in time. (MOD62, CCR6041D)
    4. Plot a user-defined telemetry point reference curve (e.g., mnemonic average value and standard deviation during a user-specifiable period derived from archive data) as an overlay to a single-mnemonic real-time plot
    5. Print to screen and hard copy devices.
  - e. Access to off-line telemetry archive to define and submit batch archive plots.
  - f. Hyperlinks to the operational database for mnemonics on plots and page displays to open a pop-up window displaying the mnemonic's database record (descriptor, yellow and red limits, EUs, calibration curve, etc.).
  - g. Telemetry display page and real-time plot definition utility.
  - h. Local copy of the telemetry and command database, command procedures, limit sets, contingency operations procedures (COPs), and other global data.
  - i. Hyperlinks to spacecraft subsystem block diagrams and Contingency Operations Procedures (COPs) associated with critical alarms.
  - j. Automatic sensing of database version changes and notification to the operator.
  - k. Audible and visual alarms for telemetry out-of-limit conditions.
19. Provide the following off-line analysis and trending capabilities:
  - a. Generation of 24-hour plots of all values for one telemetry parameter within one minute, and for six telemetry parameters within two minutes, with hard copy output available from a printer within one minute afterward. These timing requirements take effect upon receipt by the trending/analysis process of the requested archive data. (MOD36, CCR4183C)

- b. Batch (scheduled) and interactive (non-scheduled) plot definition and submission from any GTACS operator position.
  - c. Prioritization of plot requests to favor interactive plot requests.
  - d. Monochrome and color hard copy capability.
  - e. User-defined mathematical operations on multiple user-specified telemetry parameters (e.g., an equation processor).
  - f. Generation of user-defined plots with up to six y-axis data sets versus a single x-axis data set on a single grid. It shall be possible to plot time on either axis. When time is plotted on the x-axis, it shall be specified by the user for any time frame from ½ the period of the fastest telemetered data to 30 days. The x-axis units shall be user-selectable and, at minimum, in units of seconds, minutes, hours, days or weeks.
  - g. It shall be possible to put up to eight of these grids on an 8-½" by 11" page. Each grid on the page shall include the date and time the data was submitted for initial processing and the actually plotted. The page shall also identify the data set or file from which the data was extracted. User-defined optional data fields consisting of at least primary and secondary titles 80 characters long.
  - h. If data thinning methods are employed, the minimum, maximum, and time integrated average of the data points shall be saved for the time span over which the data was thinned. The thinning method shall be selectable to be over a time period or over a number of points.
  - i. Data shall be tagged with questionable or static data flags, and the user shall have the option to include or exclude questionable and static data. An optional notation shall be provided to indicate the fraction of good data in the selected data set.
  - j. Data gaps shall be indicated on plots by pen-ups.
  - k. Generation of tabular telemetry value (TVAL) reports in file and hard copy form.
  - l. Support other capabilities detailed in GEAS documentation.
  - m. Black and white, and color laser print capability equivalent to the existing SOCC QMS-1725 and QMS-MCX-1 printers, respectively.
20. As a minimum, provide the GOES I-M Scheduler Workstation capabilities specified in the GIMTACS Functional Specification and the following specific capabilities:
- a. Import, create, edit, store, and print spacecraft command procedures (CPs).
  - b. Create time-tagged 24-hour command schedules for spacecraft stored-command uploads and commanding from GTACS Ops/Eng positions. These schedules shall be generated using raw commands and CPs, and shall take into account special instrument operations, such as calibrations, star looks, etc., and solar/lunar exclusion zones.
  - c. Verify the accuracy of schedules to ensure no commands inimical to the health and safety of the spacecraft and instruments are included.
  - d. Provide schedule templates to permit building special schedules (e.g., rapid and super-rapid scans) for ~~rapidly~~ ground and stored program use, such that only particular parameters as scan coordinates and execution time need be provided for activation. (MOD62, CCR6041D)
  - e. Print CPs, schedules, and reports at a workstation or line printer.
  - f. Provide a file management utility to browse, select, delete, edit, rename, copy, and protect CPs, schedules, and reports.
  - g. Provide listings of the contents of CPs, schedules, and reports via printers or workstation screen display.
  - h. Perform instrument scan coordinate conversions.
  - j. Provide schedule shadowing on the ground that will give visibility into the execution of onboard scheduling commands (including Instrument Objects), support parallel telemetry monitoring on the ground, and allow operator to stop on-board schedule execution and resume schedule execution on the ground. (MOD24, CCR6008)



**7.2.4 MDL Receive System and MPS Server** - In addition to the general requirements presented in section 7.1 and subsection 7.1.6, the GOES N-Q MDL receive system and MPS server shall:

1. Provide intermediate frequency (IF) receive systems and computer systems to demodulate, bit synchronize, demultiplex, decommutate, and archive simultaneously the MDL data streams from three GOES N-Q spacecraft.
2. Provide a new or modified DID function to be resident on the MPS workstations to process the GOES N-Q spacecraft MDL attitude data. The GOES N-Q DID shall provide, as a minimum, the system functional capabilities and an equivalent level of operability and performance as specified in the GOES IJK/LM Operations Ground Equipment (OGE) Operations and Maintenance Manuals, DRL 504-06, Part 14 of 22, Dynamic Interaction Diagnostic (DID) User's Manual, Apr. 1997.
3. Comply with the interfaces specified in the ICD for the Solar X-Ray Imager Ground Support Equipment and Hughes GOES Satellite N-Q Integration and Test, April 29, 1999, LMSAL SXI-98-0413F, the Dynamic Interaction Diagnostic (DID) Hardware and Software Maintenance Manuals, and the Operations Ground Equipment (OGE) Interface Specification. (MOD 62, CCR6041D)
4. Provide a sufficiently flexible and modular DID design to accommodate, with minimal code changes, any new data handling, data storage, and INR requirements imposed by advanced Imager and Sounder instruments and a LM instrument.
5. Send SXI instrument housekeeping, event, and RAM/EEPROM table dump data packets in unsolicited 504-02 formatted external messages; selectively stream one or both spacecraft 4 kbps PCM telemetry data streams to GTACS upon command from GTACS; and send PCM telemetry data from up to two GOES Instruments of Opportunity (IOOs) on the GOES O-Q spacecraft. In making provision for the IOOs, the spacecraft contractor can assume the IOOs will comply with the Interface Requirements Document for Geostationary Operational Environment Satellites (GOES) N-Q Instrument(s) of Opportunity, Rev. A, February 1999. (Mod 40, CCR4133D)
6. Provide a circular on-line (i.e., disk) data storage capability for one week of MDL data (including SXI and LM data) for three spacecraft, plus an additional 10 Gigabytes of on-line storage for user work space and save areas.
7. Provide a capability to generate off-line archive tapes automatically or with minimal operator involvement and the capability for users to download selected data sets to tape for export.
8. Provide an archive directory facility capable of accessing all MDL data stored in the on-line archive.
9. Provide a capability to import/recover archive data from off-line tapes.
10. The DID shall provide offline archive tape backup in a 4 mm tape format. (Mod 49, CCR4226C)

**7.2.5 Digital Wideband Tape Recorders (DWTR)** - The DWTR shall meet the following requirements:

1. The DWTR shall be able to simultaneously record GOES I-M satellite data including all three wideband data streams: Imager, Sounder, and MDL. The DWTR must be able to replay this data to reproduce the same data streams.
2. The DWTR shall be able to record or replay GOES NOPQ satellite data including four simultaneous data streams: Imager, Sounder, and the two MDL/SXI (CCSDS) interleaved channels.
3. The DWTR shall have an upgrade option for recording/replaying a minimum 5 megabites per second combined data rate for the four input and output channels.
4. The DWTR shall be capable of accepting the NRZ-S signal from the electronics boxes of the Imager, Sounder, and SXI directly, for instrument level testing.

The EMC test requirements herein, when performed as a set, are intended to provide an adequate measure of hardware quality and workmanship. The tests are performed to fixed levels intended to envelope those to be expected during a typical mission and also allow for some hardware degradation during the mission.

Most of the EMC test requirements are based on the requirements of MIL-STD-461C and 462, as amended by Notice 1. All references in this document to MIL-STD-462 assume reference to Notice 1. (Note: Please refer to Appendix A, Deviation and Waiver Requests for Paragraph 8.4) (MOD 62, CCR 6187)

**8.4.2 Launch Vehicle Compatibility** - Additional EMC requirements may be placed on the spacecraft by the launch vehicle or launch site, so test levels shall be tailored to include the launch vehicle and launch site environment. These EMC requirements shall be established during coordination between the contractor and the launch vehicle contractor.

**8.4.3 Spurious Signals** - Spurious signals above specified limits shall be eliminated. Spurious signals below specified limits shall be analyzed to determine if a subsequent change in frequency or amplitude is possible. If possible, the spurious signals shall be eliminated to protect the spacecraft and instruments from the possibility of interference. Retest shall be performed to verify that intended solutions are effective.

**8.4.4 Testing at Lower Levels of Assembly** - Testing shall be performed at the component, subsystem and spacecraft assembly levels. Testing at lower levels of assembly has many advantages: it uncovers problems early in the program when they are less costly to correct and less disruptive to the program schedule; it uncovers problems that cannot be detected or traced at higher levels of assembly; it characterizes box-to-box EMI performance, providing a baseline that can be used to flag potential problems at higher levels of assembly; and it aids in troubleshooting.

#### **8.4.5 Conducted Emission Requirements**

**8.4.5.1 Narrowband Conducted Emissions** - The narrowband conducted emissions on the instrument (42V) power and power-return leads shall be limited to the levels specified in Figure 8.4.5.1. Testing shall be in accordance with MIL-STD-461C and 462, test numbers CE01 and CE03, with limits as shown in Figure 8.4.5.1.

**8.4.5.2 Broadband Conducted Emissions** - Broadband conducted emissions on the instrument (42V) power, and power-return leads shall be limited to the levels specified in Figure 8.4.5.2. Testing shall be in accordance with MIL-STD-461C and 462, test number CE03, with limits as shown in Figure 8.4.5.2.

**8.4.5.3 Common Mode Noise Conducted Emissions** - A conducted emissions test to control common mode noise (CMN) shall be required for the spacecraft. This frequency domain current test shall be performed on all non-passive components which receive or generate 42V instrument spacecraft primary power. The CMN limit requirements are described in Figure 8.4.5.3. The CMN test procedure is the same as the narrowband CE01/03 tests, except that the current probe is placed around both the plus and return primary wires together.

**8.4.5.4 Conducted Emissions on Antenna Terminals** - Conducted emissions on the antenna terminals of spacecraft receivers and transmitters in key-up modes shall not exceed 34 dB $\Phi$ V for narrowband emissions and 40 dB $\Phi$ V/MHz for broadband emissions.

Harmonics greater than the third and all other spurious emissions from transmitters in the key-down mode shall have peak powers 80 dB down from the power at the fundamental. Power at the second and third harmonics shall be suppressed by  $50 + 10 \text{ Log [peak power in watts at the fundamental] dB}$ , or 80 dB, whichever requires less suppression.

Testing shall be in accordance with MIL-STD-462, test number CE06. The test is conducted on receivers and transmitters before they are integrated with their antenna systems.

**8.4.5.5 Conducted Emissions for 30V and 53V Components** - The conducted emission requirements for components that are connected to the 30V and 53V busses are described in Figure 8.4.5.5-1.

#### **8.4.6 Conducted Susceptibility Requirements**

**8.4.6.1 Conducted Susceptibility CS01 & 02 (Power Lines)** - This test shall be conducted for instruments connected to the 42V bus over the frequency range of 30 Hz to 400 MHz in accordance with the limit requirements and test procedures of MIL-STD-461C and 462. If degraded performance is observed, the signal level shall be decreased to determine the threshold of interference. Above 50 kHz, modulation of the applied susceptibility signal is required. If the modulation has not been established by component design or mission application, the following guidelines for selecting an appropriate modulation apply:

1. AM Receivers - modulate 50% with 1000 Hz tone.
2. FM Receivers - while monitoring signal-to-noise ratio, modulate with 1000 Hz signal using 10 kHz deviation. When testing for receiver quieting, use no modulation.
3. Components with video channels other than receivers. Modulate 90 to 100% with a pulse of duration  $2/BW$  and repetition rate equal to  $BW/100$ , where  $BW$  is the video bandwidth.
4. Digital components use pulse modulation with pulse duration and repetition rate equal to that used in the component under test.
5. Non-tuned components use 1000 Hz tone for amplitude modulation of 50%.

**8.4.6.1.1 Conducted Susceptibility for 30 and 53V Components** - The conducted susceptibility requirements for components that are connected to the 30V and 53V busses are described in Figure 8.4.6.1.1-1.

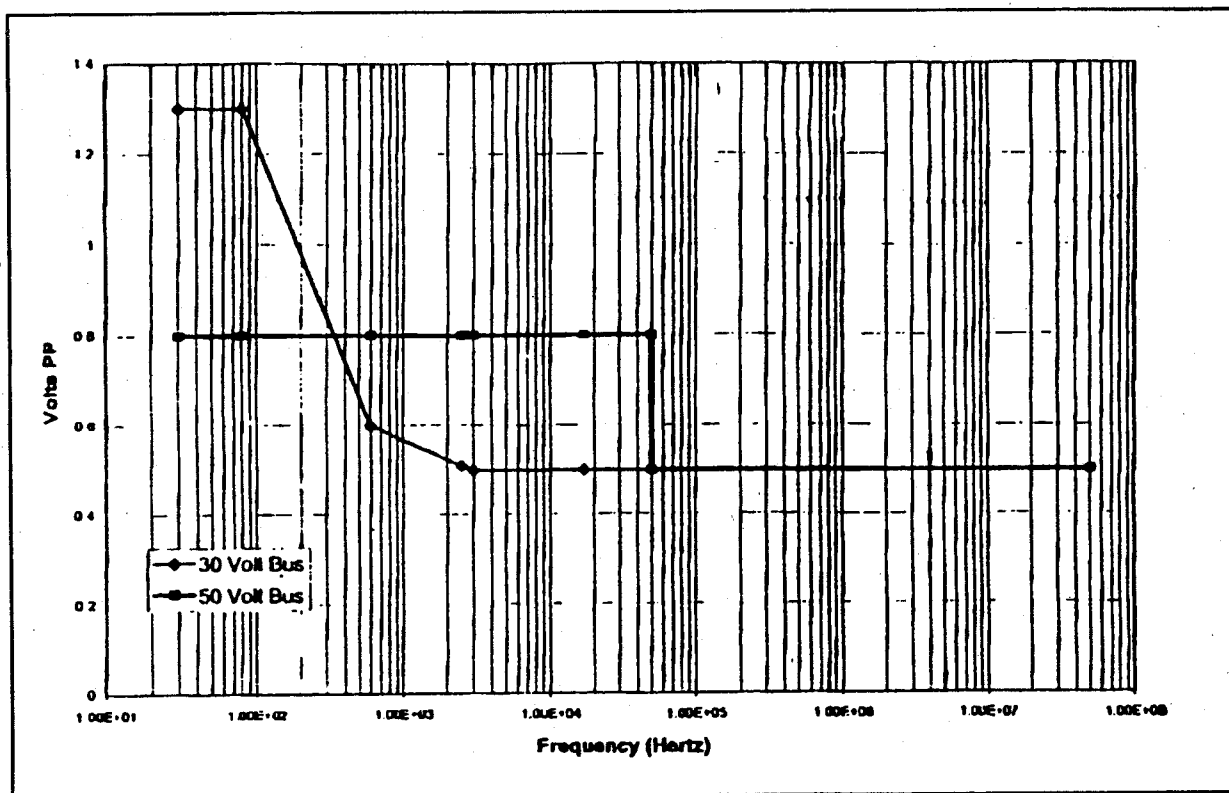
**8.4.6.2 Conducted Susceptibility CS03 (Two-signal Intermodulation)** - This test, which determines the presence of intermodulation products from two signals, shall be conducted on receivers operating in the frequency range of 30 Hz to 18 GHz, where this test is appropriate for that type of receiver. The items shall perform in accordance with the limit requirements and the test methods of sections 8.4.7.2.5, 8.4.10, 10.1 and 10.2 of the S-415-22 Performance Specification and paragraphs 3.3.8 and 3.4.4.4 of the S-415-23 Statement of Work. (MOD 62, CCR6152)

**8.4.6.3 Conducted Susceptibility CS04 (Rejection of Undesired Signals)** - Receivers operating in the frequency range from 30 Hz to 18 GHz shall be tested for rejection of spurious signals where this test is appropriate for that type of receiver. The items should perform in accordance with the limit requirements and the test methods of sections 8.4.7.2.5, 8.4.10, 10.1 and 10.2 of the S-415-22 Performance Specification and paragraphs 3.3.8 and 3.4.4.4 of the S-415-23 Statement of Work. (MOD 62, CCR6152)

8.4.6.4 **Conducted Susceptibility CS05 (Cross Modulation)** - Receivers and tuned amplifiers operating in the frequency range of 30 Hz to 18 GHz shall be tested to determine the presence of cross-modulation products. The items shall perform in accordance with the limit requirements and test methods of sections 8.4.7.2.5, 8.4.10, 10.1 and 10.2 of the S-415-22 Performance Specification and paragraphs 3.3.8 and 3.4.4.4 of the S-415-23 Statement of Work. (MOD 62, CCR6152)

8.4.6.5 **Conducted Susceptibility CS06 (Powering Transient)** - A transient signal shall be applied to instrument 42V power lines in accordance with MIL-STD-461C and 462 procedures. The applied transient signal shall equal the powering voltage, with the resulting total voltage at twice the powering level. The transient shall be applied to the input power leads for a duration of 5 minutes at a repetition rate of 60 pulses per second (pps).

Figure 8.4.6.1.1-1  
Conducted Susceptibility Limits for the Components in the 30v and 53v Busses



workmanship defects. The qualification or acceptance temperature margin should be increased by  $\pm 5^{\circ}\text{C}$  if testing at ambient pressure is performed. The number of thermal cycles shall be increased by 50% if testing at ambient pressure.

(Note: Please refer to Appendix A Deviation and Waiver Request), CCR6015A, and 6132; MOD 62, CCR 6188)

2. Duration - The total test duration shall be sufficient to demonstrate performance and uncover early failures. The intent of performance testing at each extreme is to ensure that key electrical parameters remain within acceptable limits and do not degrade. Minimum temperature dwell times are as follows:

- a. Spacecraft Level - A minimum of 24 hours at each extreme of each temperature cycle. The thermal soaks shall be of sufficient duration to allow time for performance tests.
- b. Component Level (including SEM instruments) - A minimum of four hours at each extreme of each temperature cycle. The thermal soaks shall be of sufficient duration to allow time for performance tests.

(Note: Refer to CCR6015A (Deviation Request) in Appendix A)

3. Functional Test - Because of the length of time involved, it may be impractical to conduct a comprehensive electrical functional test during spacecraft level thermal-vacuum verification. With GSFC approval, a limited functional test may be substituted if satisfactory performance is demonstrated for the major mission-critical modes of operation.
4. Pressure - The chamber pressure after the electrical discharge checks are conducted shall be less than  $1.33 \times 10^{-3} \text{ Pa}$  ( $1 \times 10^{-5} \text{ torr}$ ).
5. Turn-on Demonstration - Turn-on capability shall be demonstrated under vacuum at least twice at both the low and high temperatures, as applicable. The ability to function through the voltage breakdown region shall be demonstrated if applicable to mission requirements (all elements that are operational during launch).

(Note: Refer to CCR Number 4102 (Deviation request) in Appendix A)

**8.5.3.3 Test Setup** - The setup for the test, including any instrument simulators, shall ensure that the test objectives will be achieved, and that no test-induced problems are introduced. The spacecraft shall be, as nearly as practicable, in flight configuration. Critical temperatures shall be monitored throughout the test and "alarmed" if possible. The spacecraft operational modes shall be monitored.

(Note: Refer to CCR Number 4102 (Deviation request) in Appendix A)

#### 8.5.3.4 *Demonstration*

1. Electrical Discharge Check - Items that are electrically operational during pressure transitions shall undergo an electrical discharge check to ensure that they will not be permanently damaged from electrical discharge during the ascent and early orbital phases of the mission. The test shall include checks for electrical discharge during the corresponding phases of the vacuum chamber operations.
2. Outgassing Phase - If the test article is contamination sensitive (or if required by the contamination control plan), an outgassing phase shall be included to permit a large portion of the volatile contaminants to be removed. The outgassing phase shall be incorporated into a hot exposure during thermal-vacuum testing. The test item shall be cycled hot and remain at this temperature until the contamination control monitors indicate the outgassing has decreased to an acceptable level.
3. ~~Hot and Cold Start Demonstrations - Start-up capability shall be demonstrated to verify that the test item will turn on after exposure to the extreme temperatures that may occur in orbit. For this check, the test item may be in one of three modes: commanded-off, undervoltage-recycle, or high-voltage.~~
4. Hot and Cold Conditions - The duration of the hot or cold phase shall be at least sufficient to permit the performance of the functional tests with a minimum soak time of 4 hours for components, 12 hours for subsystems and instruments, and 24 hours for spacecraft testing.
5. Transitions - The test item shall remain in an operational mode during the transitions between temperatures, so its operation can be monitored under the changing environment. The requirement may be suspended when item turn-on is to be demonstrated after a particular transition. In certain cases, it may be allowable to remove thermal insulation to expedite cool-down rates. Caution must be taken, however, not to violate temperature limits or induce test failures through excessive gradients.

8.5.3.5 *Special Tests* - Special tests are required to evaluate unique features, such as a radiation cooler, or to demonstrate the performance of external devices, such as solar array hinges or deployable booms, that are deployed after the spacecraft has attained orbit. The test configuration shall reflect, as nearly as practicable, the configuration expected in flight. In particular, a temperature/illumination test shall be performed on the solar and yoke panel assemblies at the upper operating temperature to demonstrate adequate power capacity by comparing LAPSS data at room and elevated temperatures. (MOD 62, CCR6173)

8.5.3.6 *Trouble-free Performance* - At least 100 trouble-free hours of functional operations shall be demonstrated in the thermal verification program (refer to section 8.1.4).

8.5.4 *Thermal Design Verification* - Verification of the thermal control requirements shall be demonstrated through successful spacecraft level thermal balance test results, successful pre-flight temperature predictions, and successful flight temperatures.

The spacecraft level thermal balance test program shall demonstrate successful thermal performance under the conditions of: (1) summer solstice, (2) winter solstice, (3) equinox, and (4) equinox eclipse, starting from condition 3 steady state. The thermal balance test program will be considered successful if the combined comprehensive spacecraft-instrument analytical model can correlate predicted temperatures with test data, and if: (1) component or simulated component temperatures are all within the component MAT limits (operating and non-operating, as appropriate), and (2) all transistor collector junction temperatures are as specified in section 10.6.2.

In addition to successful spacecraft level thermal balance test results, thermal control requirements shall also be verified by demonstrating combined comprehensive spacecraft-instrument analytical model preflight predicted flight temperatures within the MAT limits, and by achieving actual flight temperatures within the MAT limits.

The energy-dependent and the directional responses of the sensors shall be determined for energies ranging from the detector's low-energy threshold to energies for which the particle flux is below the instrument detection threshold, assuming particle flux levels given by the maximum particle fluxes specified in sections 9.1.3.3, 9.1.3.6, and 9.1.3.9.

9.1.3.17 **Contaminants** - The response of the various data channels to particles out-of-aperture or of a different species or energy shall be minimized and shall be determined by analysis and/or test. The spacecraft contractor shall provide correction algorithms for the out-of-aperture and out-of-band response of all channels to the full range of flux levels specified in Sections 9.1.3.3, 9.1.3.4, 9.1.3.6, 9.1.3.7, 9.1.3.9, and 9.1.3.10.

9.1.3.18 **Radiation Damage** - The spacecraft contractor shall demonstrate the steps taken to minimize and/or mitigate the effects of radiation damage on the sensor systems during the design lifetime of the spacecraft.

9.1.4 **High Energy Proton and Alpha Detector (HEPAD)** - Measurements of the proton flux above 350 MeV and of the alpha-particle flux above 640 MeV/nucleon shall be provided.

9.1.4.1 **Spectral Bands** - Proton flux shall be measured in at least three contiguous, differential energy bands, between approximately 350 MeV and 700 MeV or above, together with an integral band above the upper differential band. Alpha particle flux shall be measured in at least one band from approximately 640 MeV/nucleon to 850 MeV/nucleon and one integral band above the differential band limit.

9.1.4.2 **Field of View** - The detector acceptance aperture shall have a half angle greater than 24°. The aperture shall be centered within 5° of the equatorial plane and within 100° of the local zenith (radially outward from Earth).

9.1.4.3 **Geometric Factor** - The geometric factor shall be no less than 0.7 (cm<sup>2</sup>-sr). (Mod 62, CCR4268)

9.1.4.4 **Singles Channels** - For a design similar to the current HEPAD instrument, primary data channels shall be supported by additional channels as necessary. As a minimum, there shall be a single channel at the lowest threshold of each separate detector used and a fast coincidence channel from the lowest threshold of each separate detector.

9.1.4.5 **Accumulation Efficiency** - The accumulation efficiency is defined as the percentage of events detected that are actually accumulated and further processed. The accumulation efficiency for the two highest energy proton channels shall not be less than 80%. The accumulation efficiency for the remaining four primary data channels shall not be less than 40%. Accumulation efficiency of the singles channels shall be adequate for their use in determining reliability of the data from the primary proton and alpha particle channels.

9.1.4.6 **Stability and Accuracy** - The data channel energy thresholds and the intensity measurement shall be accurate to better than 15% over the expected operating temperature range and supply voltage range.

9.1.4.7 **Data Rate** - Each of the six primary data channels shall be measured at least once every 60 seconds. Each of the singles channels shall be measured at least once every 300 seconds. Accumulation intervals for the singles channels shall be coincident with the primary data channels.

9.1.4.8 **Count Resolution** - Data compression shall be used to accommodate the maximum accumulator

characteristics of their respective flight panel and may only vary in size. A minimum of 800 thermal cycles at qualification temperatures shall be performed on the life cycle test coupons for GOES N, O, P, and Q. The life cycle test coupon can be eliminated if a previous life cycle test coupon exists which is identical in all the design and construction characteristics of the respective GOES N, O, P, or Q solar panel and the number of cycles and temperature ranges envelope those of GOES N, O, P, and Q. A thermal cycle test and a thermal-vacuum cycle test shall be conducted on all the populated GOES N, O, P, and Q flight panels. The thermal cycle test shall consist of a minimum of eight thermal cycles and the thermal-vacuum cycle test shall consist of a minimum of four thermal-vacuum cycles as defined in 8.5.3.2 of this spec. The thermal cycling test shall be conducted at the component level and the thermal-vacuum cycling test shall be conducted at the spacecraft level to the appropriate temperatures defined in Table 10.5.4.1. However, if during the spacecraft thermal-vacuum testing, the flight panels will not achieve temperatures within  $\pm 5^{\circ}\text{C}$  of the appropriate temperatures defined in Table 10.5.4.1, a component thermal-vacuum test to the appropriate levels defined in Table 10.5.4.1 shall be performed and the minimum dwell time is one hour. This component thermal-vacuum cycling test shall consist of a minimum of 8 thermal-vacuum cycles as defined in 8.5.3.2. The component thermal-vacuum cycling test performed on the flight panels may serve as a replacement for the required component thermal cycling and spacecraft level thermal-vacuum cycling tests on the flight panels. In the event of a conflict between sections 8.5.3.2 and 10.5.4.1, section 10.5.4.1 shall govern. All the flight panels shall be measured with temperature-controlled quartz crystal microbalances (TQCM) in thermal vacuum to verify that the solar array outgassing requirement is met in accordance with paragraph 10.11.3. If the solar array outgassing requirement is not met, a corrective bake-out phase will be assessed and implemented. For GOES N, obtain at least 12 GOES N solar cells and verify that the average Solar Absorptance is consistent with the established MAT range. (MOD 43, CCR 6091B), (MOD 62, CCR6173)

Table 10.5.4.1 GOES N, O, P, and Q Solar Panel  
Protoflight And Acceptance Test Levels

Test	Protoflight Test Levels	Acceptance Test Levels
Thermal Cycling	15 °C above the high temperature extreme of the MAT range 15 °C below the low temperature extreme of the MAT range	10 °C above the high temperature extreme of the MAT range 10 °C below the low temperature extreme of the MAT range
Thermal - Vacuum Cycling	15 °C above the high temperature extreme of the MAT range <b>Cold Extreme: -150 °C</b>	5 °C above the high temperature extreme of the MAT range <b>Cold Extreme: -150 °C</b>
Structural Loads	1.25 x Limit Load	1.0 x Limit Load

- 10.5.4.2 **Solar Array Performance Verification** – Following completion of component environmental testing and prior to shipment to the launch site, the GOES N-Q solar array shall be LAPPS tested to verify BOL power generation levels and demonstrate full range of travel of the Solar Array Drive (SAD). (MOD 49, CCR 4226C)
- 10.5.4.3 **Solar Array BOL Power Verification** – A Large Array Pulse Solar Simulation (LAPSS) test shall be conducted following component level environmental testing and prior to flight integration on the spacecraft to verify the BOL power generation of the GOES N-Q solar array. (MOD 49, CCR 4226C)
- 10.5.4.4 **Solar Array Drive (SAD) Verification** – Following environmental testing and prior to flight integration of the solar array to the spacecraft (i.e., solar array and yoke removed), the Solar Array Drive (SAD) shall be tested through its full-range of motion. (MOD 49, CCR 4226C)



**10.11.3 Outgassing Requirements** - In order to minimize outgassing of the overall system, all spacecraft and launch vehicle nonmetallic materials shall be screened for total mass loss (TML) and collected volatile condensable material (CVCM) when exposed to a vacuum environment. Polymeric materials shall be screened to meet # 1.0% for TML and # 0.1% for CVCM. Special processing or high temperature vacuum bakeouts are permitted to qualify a high outgassing material, with GSFC concurrence. Refer to NASA RP 1124 for material outgassing data.

All multilayer insulation (MLI) and spacecraft surfaces located near the instrument optical ports and cooler surfaces shall be vacuum baked to meet the following outgassing rate requirement: an outgassing rate of  $6.55 \times 10^{-9}$  g/cm<sup>2</sup>-hr as measured with a 15 MHz (sensitivity of  $1.56 \times 10^{-9}$  g/cm<sup>2</sup>-Hz) temperature-controlled quartz crystal microbalance (TQCM) averaged over an 8-hour period. The TQCM measurement shall utilize an outgassing test box where the TQCM sensor is located inside a control vented test box. The temperature of the hardware shall be 10°C above the maximum on-orbit predicted temperature, and the TQCM shall collect at -10°C below the on-orbit instrument coldest exposed temperature. All MLI and spacecraft vents shall be directed away from the Imager and Sounder instrument optical ports and cooler surfaces, and away from the SXI optical and thermal control surfaces.

Outgassing rates for the solar array shall be established based upon the performance degradation of the SXI optical and thermal surfaces according to on-orbit operational temperatures. All spacecraft panel surfaces with a view to the SXI radiator and aperture plate shall be vacuum baked. MOLEFLUX or equivalent modeling analyses shall be performed using outgassing rates from the solar array and panel surfaces with a view of the SXI to ensure the SXI performance requirements have not been compromised. To minimize deposition on the SXI, the solar array and panel surface, outgassing rates shall be less than  $3.12 \times 10^{-7}$  g/cm<sup>2</sup>-hr as measured on both sides of the solar array using a 15 MHz (sensitivity of  $1.56 \times 10^{-9}$  g/cm<sup>2</sup>-Hz) TQCM averaged over an 8-hour period. The TQCM FOV shall be completely filled by the solar array. The outgassing rate shall be measured with the solar array at 10°C above the maximum on-orbit operating temperature, and the TQCM at 10°C below on-orbit operating temperature of the SXI aft radiator plate.

(Note: Please refer to Appendix A, Deviation and Waiver Requests for Paragraph 10.11.3) (MOD 24, CCR 6004; MOD 36, CCR 6058; MOD 40 CCR 6072, CCR 6046A, CCR 6045A; MOD 48 CCR 6074, CCR 6081, CCR 6099; MOD 53 CCR6123A; MOD 62 CCR 6130, CCR 6139, 6140, CCR 6178, CCR 6179)

**10.11.4 Plume Impingement** - All ascent, transfer orbit, and station keeping thruster firings shall be analyzed to determine if any of the cleanliness requirements in section 10.11.2 are exceeded during the mission life.

**10.11.5 Purge Requirements** - Refer to the GFE instrument ICDs and CDRL SDA-3.2.17-01 for instrument purge requirements and launch vehicle requirements.

**10.11.6 Storage and Transportation** - During storage and transportation periods, the spacecraft and instruments shall be bagged in ESD protective material meeting surface cleanliness requirements and facility requirements. The hardware or representative witness samples shall be examined/changed out every 6 months during extended storage periods. Any storage containers used during spacecraft storage periods shall not be opened or stored in environments other than those specified in section 10.11.1.

**\*\* UPDATED TO MOD 62 \*\***

**ATTACHMENT G**

**S-415-26**

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**CONTRACT DATA REQUIREMENTS LIST**  
**FOR THE**  
**GEOSTATIONARY OPERATIONAL ENVIRONMENTAL**  
**SATELLITE**  
**GOES-N, O, P, Q PROGRAM**

**AUGUST 26, 1997**

**NASA/GODDARD SPACE FLIGHT CENTER**  
**GREENBELT, MARYLAND 20771**

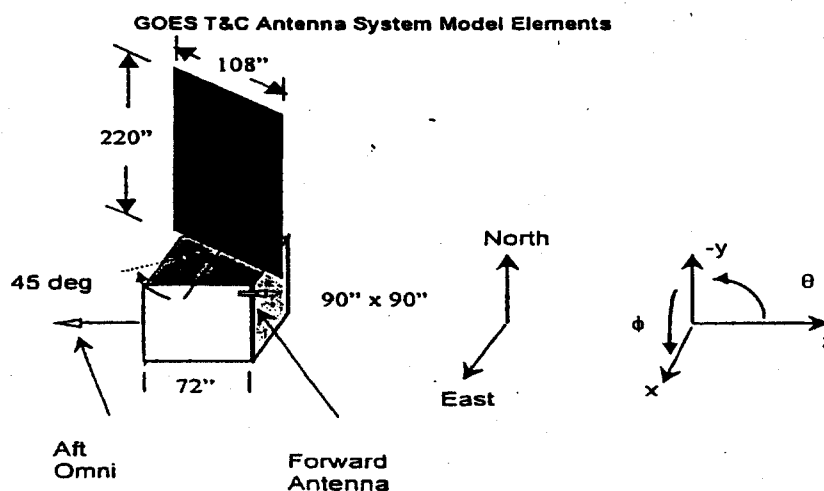
DATA ITEM DESCRIPTION		2. NUMBER	SDA-3.2.8-02
1. TITLE	Communications Subsystem Component Computer Simulation Models (Cont.)	3. DATE	8/26/97

## 5. DATA REQUIREMENTS - Cont.

- f. Predicted on-orbit antenna coverage and polarization patterns shall be performed with no greater than 1 degree increment over twice the on-orbit coverage range with the spacecraft configured in the on-orbit configuration (deployables deployed).
- g. Composite coverage and polarization patterns for the T&C antenna system, made up of more than one discrete radiating element, shall be provided. Composite patterns may be derived analytically using the Geometric Theory of Diffraction modeling tool. The amplitude and phase measurements of each discrete radiating element shall be used as model inputs. The modeling may use representative elements and scattering structures of the satellite in flight configuration. As shown in the figure, the modeling may represent the satellite by a box for the bus and a plate for the solar array. The composite patterns shall have angular increments no greater than 1 degree. For a single TT&C antenna, the measurement increments shall be no greater than 2 degrees along the axis of greatest variation.

CCR 6080  
MOD 62

All antenna patterns shall be performed at the assigned operating frequency or at lower edge and upper edge for antennas which provide for multiple carriers. Each antenna pattern data shall be referenced to an isotropic antenna and the spacecraft axis. All antenna pattern data shall be delivered in a standard electronic format. This data shall also include a tabulated antenna pattern printout.



CCR 6080  
MOD 62

## 6. SPECIAL PREPARATION INSTRUCTIONS

# AMENDMENT OF SOLICITATION/ MODIFICATION OF CONTRACT

OMB APPROVAL #: 2706 0042

1. CONTRACT ID CODE  
N/A

PAGE OF  
1 2

AMENDMENT/MODIFICATION NO.

ty-Three (63)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMC/Hughes - Los Angeles

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

FACILITY CODE

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NAS5-98069

10B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ Copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

HC: BX B/NC: 427 See Page 2

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(X)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X

d. OTHER (Specify type of modification and authority)  
Unilateral Modification; Clause H.6 LIMITATION OF FUNDS

E. IMPORTANT: Contractor

☒

is not,

☐

is required to sign this document and return

copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification increases the contract funding by \$10,000,000 for continued performance under this contract.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Sandra Marshall

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)

BY Sandra Marshall  
(Signature of Contracting Officer)

2/20/02

NSN 7540-01-152-8070

PREVIOUS EDITION UNUSABLE

30-105

STANDARD FORM 30 (Rev. 10-83)  
Prescribed by GSA

1. In Clause H.6, increase the funding from \$363,828,313 by \$10,000,000 to \$373,828,313. The period of allotment is from the effective date of the contract through September 30, 2002 in accordance with the contractor's correspondence dated February 15, 2002.

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2. Block 12 Accounting and Appropriation Data:

PCN: 415-52962A(1C)  
JON: 415-616-41-81-11  
APP: 802/30110(02)  
BLI: A704  
OC: 41-2550  
AMT: \$10,000,000

3. Replace pages 48 and 49 of the contract with the replacement pages included with this modification.

END OF MODIFICATION

**SECTION H OF NAS5-98069  
MODIFICATION NO. 63  
SPECIAL CONTRACT REQUIREMENTS**

The Contractor shall prepare and submit Standard Form 294 (Rev. 10-95), "Subcontracting Report for Individual Contracts" in accordance with the instructions on the back of the form.

The SF 294 must be submitted to the Contracting Officer on a semi-annual basis. This report must be received no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively. A final SF 294 must be submitted after contract completion. The final SF 294 submittal must be received no later than the due date for what would have been the next semi-annual report.

**d. Reporting to NASA Headquarters (SF 295--Semi-annual)**

The Contractor shall prepare and submit Standard Form 295 (Rev. 10-95), "Summary Subcontract Report" in accordance with the instructions on the back of the form and in accordance with NASA FAR Supplement clause 18-52.219-75, "Small Business and Small Disadvantaged Business Subcontracting Reporting" of this contract.

The SF 295 must be submitted to "NASA, Office of Procurement, Code HC, Washington, D.C. 20546-0001" on an semi-annual basis no later than April 30 and October 30 each year for the reporting periods ending March 31 and September 30, respectively.

**e. Subcontractor Reporting**

FAR clause 52.219-9 and NASA FAR Supplement clause 18-52.219-75 require that the Contractor ensure that SF 294 and SF 295 reports are submitted by those subcontractors that have been required to adopt a Subcontracting Plan under the terms of the clause. These subcontractor reports must be submitted as required by paragraphs (c) and (d) above. The reports may be submitted through the Contractor or submitted directly. Regardless, the Contractor is responsible for ensuring proper and timely submittal of the required reports.

(End of clause)

**H.6 LIMITATION OF FUNDS (FIXED-PRICE CONTRACT) (18-52.232-77) (MAR 1989)**

(a) Of the total price of CLINs 1 through 14, the sum of \$373,828,313 is presently available for payment and allotted to this contract. It is anticipated that from time to time additional funds will be allocated to the contract in accordance with the following schedule, until the total price of said item is allotted:

**SECTION H OF NAS5-98069  
MODIFICATION NO. 63  
SPECIAL CONTRACT REQUIREMENTS**

**SCHEDULE FOR ALLOTMENT OF FUNDS**

Date

Amounts

To be provided by the government as funds become available.

(b) The Contractor agrees to perform or have performed work on the items specified in paragraph (a) above up to the point at which, if this contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause would, in the exercise of reasonable judgment by the Contractor, approximate the total amount at the time allotted to the contract. The Contractor is not obligated to continue performance of the work beyond that point. The Government is not obligated in any event to pay or reimburse the Contractor more than the amount from time to time allotted to the contract, anything to the contrary in the Termination for Convenience of the Government clause notwithstanding.

(c) (1) It is contemplated that funds presently allotted to this contract will cover the work to be performed until September 30, 2002.

(2) If funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until that date, or an agreed date substituted for it, the Contractor shall notify the Contracting Officer in writing when within the next 60 days the work will reach a point at which, if the contract is terminated pursuant to the Termination for Convenience of the Government clause of this contract, the total amount payable by the Government (including amounts payable for subcontracts and settlement costs) pursuant to paragraphs (f) and (g) of that clause will approximate 75 percent of the total amount then allotted to the contract.

(3) (i) The notice shall state the estimated date when the point referred to in subparagraph (2) above will be reached and the estimated amount of additional funds required to continue performance to the date specified in subparagraph (1) above, or an agreed date substituted for it.

(ii) The Contractor shall, 60 days in advance of the date specified in subparagraph (1) above, or an agreed date substituted for it, advise the Contracting Officer in writing as to the estimated amount of additional funds required for the timely performance of the contract for a further period as may be specified in the contract or otherwise agreed to by the parties.

(4) If, after the notification referred to in subdivision (3)(ii) above, additional funds are not allotted by the date specified in subparagraph (1) above, or an agreed date substituted for it, the Contracting Officer shall, upon the Contractor's written request, terminate

AMENDMENT OF SOLICITATION/  
MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

N/A

PAGE OF

1 2

2. AMENDMENT/MODIFICATION NO.

Sixty-Four (64)

3. EFFECTIVE DATE

See Block 16C

4. REQUISITION/PURCHASE REQ. NO.

See Block 12

5. PROJECT NO. (If applicable)

ISSUED BY

CODE

NASA/Goddard Space Flight Center  
GOES Procurement Office, Code 214.2  
Greenbelt, MD 20071

7. ADMINISTERED BY (If other than Item 6)

CODE

NASA/Goddard Space Flight Center and  
DCMA Boeing Space and Communications Seal  
Beach

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State, and Zip Code)

Boeing Satellite Systems, Inc.  
PO Box 92919  
Los Angeles, CA 90009

CODE

FACILITY CODE

(X)

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

X

10A. MODIFICATION OF CONTRACT/ORDER NO.  
NASS-9806910B. DATED (SEE ITEM 13)  
01/28/98

## 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ☐ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

ACCOUNTING AND APPROPRIATION DATA (If required)

PC: BX B/NC: 427 N/A

## 13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,

IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.(x)

(x)

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, Appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:  
Clause 52.243-1 Changes Fixed Price—Alt. II

d. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 3 copies to the issuing office.

14. description of amendment/modification (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification issues and definitizes Configuration Change Requests (CCR's) 4308 and 4309 at no change to the contract price.

Accordingly:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

J.T. Felicita, Manager, NASA Contracts

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

Chelia Walker

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

J.T. Felicita  
(Signature of person authorized to sign)

6/5/02

BY Chelia Walker  
(Signature of Contracting Officer)

6-10-02

NSN 7540-01-152-8070

30-105

PREVIOUS EDITION UNUSABLE

STANDARD FORM 30 (Rev. 10-83)

Prescribed by GSA



**1. In Clause J.1 LIST OF ATTACHMENTS, make the following changes:**

Attachment B, Performance Specification

In 7.2.1, change item 70 to modify the GTACS Epoch command generation process to be capable of using the addressing qualifiers, if included as part of the command, or correctly routing the commands if the addressing qualifiers are not included as part of the command. (CCR 4308)

In 7.2.1, change item 24 to delete the capability to send 24-bit commands from GTACS to the SXI Emulator (SXIE) via a LAN connection. (CCR 4309)

**2. Replace the contract areas listed below with the enclosed revised pages:**

Attachment B, Performance Specification

Cover Page  
Section 7.2.1, item 24-91

The fixed price of this contract, and the funds allotted for the performance thereof, shall not be deemed to be increased by this change order. This modification also represents a complete and equitable adjustment for the work associated with this change order and releases the Government from any and all liability under this contract for further equitable adjustment attributable to such facts and circumstances giving rise by this change which is in accordance with the CCR's listed in Block 14 of Page 1.

END OF MODIFICATION

- v. The RAM/EEPROM addresses in decimal
- vii. The individual success/fail status for each compared address.  
(MOD40, CCR4133D)

**24. Deleted (MOD64, CCR4309)**

**25.** Provide the capability to support telemetry and command interfaces to devices (e.g. programmable telemetry processors) capable of communicating with non-NOAA ground stations (e.g. DSN). (MOD49, CCR4226C)

**26.** All command level data generated by applications software within the SSGS shall be electronically transmitted to GTACS. GTACS shall, upon receipt of any command level data, generate or interface with a mini-schedule containing the appropriate sequence of command procedures interfaced with the electronically received command level data. Mini-schedules are executable STOL procedures that are constructed, based upon a pre-defined set of rules, in one of the following manners:

- a. Command procedures that use global variables as command data input to a serial proportional command.
- b. Command procedures that use global variables to calculate the command data input using STOL logic statements.
- c. Global variables contain the set of command data received and decommutated by GTACS out of the electronically transmitted message. The messages and functions that shall be supported are:
  - i. OATS 504-02 message 53, IMC coefficient command parameter for dynamic range
  - ii. OATS 504-02 message 56, stationkeeping parameters
  - iii. OATS 504-02 message 57, momentum dump command
  - iv. OATS 504-02 message 80, IMC scale factors
  - v. ISEC data to be uploaded to the spacecraft
- d. A combination of command procedures and internal STOL procedures, in a prescribed sequence. Where the internal STOL procedures are those composed of command blocks derived from the GTACS command database and from data decommutated by GTACS out of the electronically transmitted message. The messages and functions that shall be supported are:
  - i. OATS 504-02 message 51, star view command parameters
  - ii. OATS 504-02 message 53, IMC coefficient command parameters (with the exception of the dynamic range flag)
  - iii. OATS 504-02 message 55, scan frame coordinates
  - iv. OATS 504-02 message 75, IMC scale factor calibration schedule
  - v. GTACS schedule buffer loads
  - vi. GSS generated star catalog uploads

The minischedule implementation, as defined in a. through d. above, for the following messages and functions shall be defined in the working group meetings identified in paragraph 7.2.1, item 27:

- a. GSS generated parameters for spacecraft slews, quaternion and sensor alignment management
- b. OATS 504-02 message 73 (torque table updates)  
(MOD49, CCR4226C)

**27.** The spacecraft contractor shall provide technical support to engineers defining mini-schedule procedures that interface with GTACS command data processing software. (MOD49, CCR4226C)

**28.** GTACS shall provide the capability to define a maximum of 500 database pseudo-telemetry parameters

that use a combination of real-time and near real-time processing. These parameters shall have a latency not to exceed two minor frames after receipt of the last subcommutated PCM telemetry used in the pseudo-telemetry algorithm. The pseudo-telemetry shall be composed of a combination of PCM telemetry; Imager, Sounder, and SXI wideband telemetry; and mathematical instructions of the type algebraic, trigonometric, and logical in order to produce a new user-defined database telemetry value. Pseudo-telemetry shall be time-tagged relative to the last received subcommutated telemetry point used in the algorithm. GTACS shall also provide the capability for the user to start/stop near real-time pseudotelemetry processing, both individually and in groups, and to define the pseudotelemetry processing rate (as a multiple of the minor frame rate) at any time. GTACS shall process pseudotelemetry in the same manner as PCM telemetry. (MOD49, CCR4226C)

29. ~~The spacecraft contractor shall accept and implement government defined pseudo-telemetry definitions. Updated database releases containing the pseudo-telemetry shall be distributed monthly starting after post-ship delivery of the pseudo-telemetry capability. (MOD49, CCR4226C)~~
30. GTACS shall receive, process, and archive 504-02 messages from the SPS containing 88 bits of attitude data derived from the Imager and Sounder wideband data downlink. GTACS shall decommutate, engineering convert, and associate a telemetry mnemonic with each data item contained within the 88 bits. GTACS shall provide the capability to start and stop transmission of the attitude data messages from the SPS for the individual instruments. (MOD49, CCR4226C)
31. GTACS shall provide the capabilities to develop and manage RTCSs. It shall provide editing and verification/validation tools to allow development, modification, and deletion of RTCSs, subject to the constraints that RTCS: will contain only commands, relative waits and comments, and that directives within RTCSs will use mnemonics defined in the GTACS database. The required RTCS support function shall:
  - a. Provide a directory structure that allows RTCSs to be created, tested, and baselined
  - b. Provide RTCS syntax checking (compliant with paragraph 7.2.1.20k) and validation processes that perform the following functions:
    1. Perform validation checking similar to that performed on other scheduling related files as appropriate to ensure that RTCSs do not contain invalid and inimical spacecraft or payload command sequences.
    2. Permit excluding commands or sets of commands based on command mnemonics. When specifying command sets, the use of a wild card shall be available. In addition, the function shall include an ALLOW directive that permits exceptions to the general exclusion rule for individual commands.
    3. Report an error if an RTCS does not contain a NOOP command as the first command in the sequence.
    4. Generate a displayable and printable report flagging all errors.
    5. Validate the upload file to ensure that individual RTCSs in the schedule do not overlap and that the total length of the RTCS load does not exceed the onboard RTCS memory allocation.
  - c. Provide an RTCS template file for generating RTCS upload files capable of including multiple RTCSs. This template file shall specify the order via the relative and absolute RAM addresses. The RTCS ground support function shall permit the adding of an RTCS, the deleting of an RTCS, and the rearranging of individual RTCSs within the upload file.
  - d. Provide a configuration management capability for all RTCS-associated files (individual procedures, template files, listings, upload files, and upload procedures)
  - e. Generate a displayable and printable map file of the upload file showing the physical layout of the upload image. This file shall contain a listing of the individual command mnemonics, their corresponding hexadecimal representation, the absolute and relative physical RAM address, the

relative time between commands, and the total execution time (for each individual RTCS). The configured RTCS map file shall be used by the schedule generation software to reference RTCSs from within a daily schedule.

- f. Automatically generate an upload procedure for uplinking the RTCSs.
- g. Maintain ground memory images of the onboard RTCS area with the following functionality:
  - 1. To dump the onboard image and compare it to a previous load
  - 2. To update a ground memory image of the onboard RTCS from a memory dump
  - 3. To maintain a memory image of the uplinked RTCS load.
- h. Provide a directive that permits execution of an onboard RTCS by name either within the onboard schedule or by a ground controller command.
- i. Provide a directive that allows an operator to halt execution of an individual RTCS or all onboard RTCSs.
- j. Generate an event message whenever an onboard RTCS begins execution commanded either from within the onboard schedule or from the ground.

(MOD49, CCR4226C)

- 32. GTACS shall provide the capability to define, implement, and manage a set of critical alarm telemetry items (safety monitors) that, when tripped, will activate a distinct audible alarm for the operator. These safety monitors shall trip and activate a distinct audible alarm on all GTACS workstations signed onto the spacecraft configuration when any designated safety monitor telemetry violates its database-defined tolerance limit. The operator shall acknowledge each individual safety monitor trip in order to clear the audible alarm, after which the safety monitor shall not trip again until it violates the tolerance limit again. (MOD49, CCR4226C)
- 33. GTACS shall provide the capability to develop and manage Command Procedures (CPs) written in the fundamental command execution language of GTACS. (MOD49, CCR4226C)
- 34. GTACS shall provide syntax checking for all CPs and schedules. (MOD49, CCR4226C)
- 35. Deleted. (MOD49, CCR4226C)
- 36. Identical NASCOM interface capabilities shall be provided for GTACS at the SOCC, CDAS, and backup CDAS facilities. All NASCOM interfaces shall be capable of frame synchronizing the received telemetry streams. (MOD49, CCR4226C)
- 37. Deleted (MOD49, CCR4226C)
- 38. Deleted (MOD49, CCR4226C)
- 39. Deleted (MOD49, CCR4226C)
- 40. GTACS shall simultaneously receive and process up to 4 SPS and 4 MRS&S wideband telemetry streams for the same spacecraft ID. (MOD49, CCR4226C)
- 41. GTACS shall be capable of playback processing for wideband telemetry (Imager, Sounder, SXI, and IOO). ISI personnel will test this feature. (MOD49, CCR4226C)
- 42. If any telemetry minor frame contains CRC errors, then GTACS shall mark as questionable all decommutated PCM telemetry points in that minor frame. GTACS shall also mark as questionable any pseudotelemetry using any questionable telemetry in its algorithm. (MOD49, CCR4226C)

43. GTACS shall perform context dependent telemetry processing, i.e., if any decommutated telemetry point A is dependent on the value of one or more other telemetry parameters, GTACS shall use these other parameters to interpret the value and quality flags of telemetry point A. This shall apply to all PCM, SPS wideband, and housekeeping telemetry received from the MRS&S. (MOD49, CCR4226C)
44. GTACS shall perform static data flagging for all telemetry parameters if there has been no receipt of such telemetry for a duration equivalent to a user-specified multiple of the telemetry point's minor frame rate (for PCM telemetry) and 20 seconds for SPS wideband and MRS&S housekeeping telemetry. GTACS shall also mark as static any pseudotelemetry using any static telemetry in its algorithm. (MOD49, CCR4226C)
45. GTACS shall allow real-time operations adjustments by privileged operators for any telemetry limit value already defined in the telemetry database. Such limit adjustments shall not cause a permanent change in the telemetry database. The limit adjustments can be made in either raw or engineering units. Operator invocation of a limit adjustment shall be recorded in the event log. These limit adjustments shall be included in the GTACS failover information. (MOD49, CCR4226C)
46. GTACS shall allow an operator to display the name of the currently active limit set, and the current limit values for any telemetry mnemonic. (MOD49, CCR4226C)
47. GTACS shall allow the operator to disable/enable red/yellow limit alarms by telemetry mnemonic. This does not apply to critical safety monitor alarms. (MOD49, CCR4226C)
48. All requests for local archive telemetry between GTACS and other SSGS components shall be performed electronically and shall abide by the form and format of a 504-02 message. (MOD49, CCR4226C)
49. GTACS shall provide the following CP and schedule execution features:
- GTACS shall allow the simultaneous execution of schedules for the same spacecraft and spacecraft database in different stream configurations.
  - Ground shadow and ground execution schedules shall be composed of CPs, spacecraft commands, and ground system commands or directives
  - GTACS shall provide the a ground shadow and ground execution directive that will specify and invoke the next schedule to be executed upon completion of the currently executing schedule
  - GTACS shall provide the real-time operator with the capability to resume execution of an existing ground shadow and ground execution schedule at a specific time, the current time, a future time, at the current schedule line, at the next schedule line, or at a future schedule line.
  - GTACS shall provide an engineering constraint checker that will validate any schedule relative to a defined set of engineering constraints.
  - GTACS shall verify that the number of commands within a scheduled interval do not violate the allowable spacecraft command uplink rate.
  - GTACS shall suspend execution of a ground shadow and ground execution schedule under the following circumstances:
    - If a database command prerequisite fails
    - If a command cannot be executed at its specified time
    - If command verification (command counter, VCC) fails
    - If a STOL syntax error is encountered
    - If the operator invokes a schedule suspend
  - GTACS shall provide real-time operations command execution display pages for monitoring the status of past, current, and upcoming executable lines in ground shadow and ground execution commands, CPs, and schedules. GTACS shall also display the countdown of time remaining before

the next line execution.

- i. GTACS shall ensure that the execution of a ground shadow and ground execution schedule is not interrupted during the modification and update of the executing command schedule.
- j. GTACS shall provide the capability to execute a ground schedule one line at a time (step mode). There shall be a displayable flag identifying this mode of execution. This includes the capability to allow the user to bypass by any number of lines either in a backward or forward direction .
- k. A schedule or CP execution shall not suspend when an end-item database telemetry verification fails.
- l. GTACS shall provide user defined schedule time bias capability, in both the positive and negative directions, that will be applied to all absolute time scheduled CP and schedule lines in advance of, or during execution.

~~m. GTACS shall provide all of the same execution capabilities for both CPs and schedules.~~  
(MOD49, CCR4226C)

- 50. GTACS shall provide a user-defined number of command transmission retries that will be applied to all commands. When applied, all commands shall be transmitted at the normal command pace without regard to the status or number of retries. Upon timeout of the any command's verification wait duration, such commands shall be re-transmitted at the normal command pace without regard to the status or number of retries. This will be repeated for the number of retries designated by the user. (MOD49, CCR4226C)
- 51. GTACS shall verify that all serial proportional command data are within their valid ranges at command build time. If this check fails, GTACS shall abort the command build, suspend further execution of the schedule or CP, and notify the operator via an event message and alarm. (MOD49, CCR4226C)
- 52. GTACS shall store the state of a specified set of serial command data fields being changed by a command in the event that there is no normal telemetry parameter directly connected to that command data. This state shall be accessible for display and use by an operator and a CP, and shall be contained in the failover checkpoint information. (MOD49, CCR4226C)
- 53. GTACS shall maintain knowledge of the current state of all Memory Read Out (MRO) LRVs contained in the normal telemetry minor frame states. These states, in the form of mnemonic and up to 64 MRO address locations, shall be accessible to the operator for monitor and display. (MOD49, CCR4226C)
- 54. GTACS shall maintain knowledge of the number of command words existing in the onboard verify buffer. This value shall be accessible for display and use by the operator, a CP, and schedules. (MOD49, CCR4226C)
- 55. GTACS shall maintain a record of the names and buffer IDs for all schedules existing in the onboard schedule buffers. This information shall be accessible for display to the operator. (MOD49, CCR4226C)
- 56. GTACS shall maintain a record of the names and table locations for all frames existing in the onboard frame table. This information shall be accessible for display to the operator. (MOD49, CCR4226C)
- 57. GTACS shall maintain a record of the window times and table locations for all star definitions existing in the onboard star table. This information shall be accessible for display to the operator. (MOD49, CCR4226C)
- 58. GTACS shall maintain a record of the IDs and buffer location IDs for all IMC sets existing in the onboard IMC set buffers. This information shall be accessible for display to the operator. (MOD49,

CCR4226C)

59. GTACS shall insure that a scheduled ground execution command is executed on board the spacecraft at its scheduled time by accounting for the ground transmission loop delays through any NTACTS or NASCOM command destination and the GTACS processing time. (MOD49, CCR4226C)
60. While waiting for a critical command allow/cancel response, GTACS shall not process any subsequent ground execution CP/schedule lines. (MOD49, CCR4226C)
61. GTACS shall generate event log messages containing the command mnemonic and the plain text hexadecimal value of the command frame each time a command is transmitted. (MOD49, CCR4226C)
62. GTACS shall provide database defined end-item command verification. This end-item verification shall occur for a defined duration following transmission of the command, and shall account for any uplink/downlink delays. The capability to globally enable/disable this verification shall also be provided. (MOD49, CCR4226C)
63. VCC verification shall fail after 140 subsequent commands have been transmitted without VCC verification or if a duration of 10 seconds has expired without VCC verification. If a VCC verification fails, GTACS shall generate an event log message and suspend execution of the ground schedule or CP. (MOD49, CCR4226C)
64. GTACS shall provide the user with a directive that synchronizes the ground VCC with the telemetered VCC. (MOD49, CCR4226C)
65. GTACS shall provide a scheduler directive to request eclipse and keep-out zone season predictions from OATS. This request shall be in the form of a 504-02 consistent format request message to OATS. (MOD49, CCR4226C)
66. GTACS shall provide a scheduler directive to request intrusion and RFI predictions from OATS. The request shall be a 504-02 format message. (MOD49, CCR4226C)
67. GTACS shall, upon receipt of an IMC set ready message, notify the operator via an event message. (MOD49, CCR4226C)
68. GTACS shall perform database-defined prerequisite state checking before transmitting a ground execution command. A minimum of three prerequisite states using logical operands shall be definable for any single command. If any of the checks fail, GTACS shall not transmit the command, shall notify the operator with an event log message, and shall suspend CP or schedule execution. GTACS shall provide the user with an enable/disable capability for this feature. (MOD49, CCR4226C)
69. GTACS shall verify that any command pacing constraints are satisfied for both ground and onboard execution commands, CPs, and schedules. (MOD49, CCR4226C)
70. GTACS shall maintain the status of CTCU and RT all the command addressing states and of the command mode (encrypted or clear). It shall use these states for command construction, such that they need not be explicitly included on the command line. ~~GTACS shall detect when any of this information is changed by command, and shall automatically update its status information.~~ GTACS shall also provide the capability for the user to change these states, and to monitor and display them. GTACS shall also use the addressing states to generate commands when they are included on the

command line, i.e., GTACS shall be backwardly compatible with the existing command generation process. (MOD 64, CCR4308) (MOD49, CCR4226C)

71. GTACS shall maintain the status of the schedule mode (STEP or CONTINUOUS); schedule status (EXECUTING or SUSPENDED); prerequisite verification status (ON or OFF); end-item verification status (ON or OFF); 2-step command mode status (ON or OFF); schedule name (if a schedule is currently in progress); CP name (if a CP is currently in progress). GTACS shall provide the capability for the user to monitor and display this information. (MOD49, CCR4226C)
72. GTACS shall provide a display page of all incoming and outgoing data source interfaces with NTACTS, NASCOM, and the SPSs. Attachment A provides an example illustrating the type of information to be provided on this data page. (MOD49, CCR4226C)
73. GTACS shall provide a display page of all telemetry and command resource configurations and interfaces with NTACTS, NASCOM, and the SPSs. This shall include telemetry sources and destinations (for all incoming normal, dwell, and wideband telemetry), command destination, and data stream ID. Attachment B provides an example illustrating the type of information to be provided on this configuration page. (MOD49, CCR4226C)
74. GTACS shall provide a display page of the quality of any active NASCOM streams. Attachment C provides an example illustrating the type of information to be provided on this page. (MOD49, CCR4226C)
75. GTACS shall provide graphical monitoring display pages as follows:
  - a. An equipment configuration page that provides a graphical representation of the SOCC, CDAS, and backup CDAS SSGS online and offline equipment. Attachment D provides an example illustrating the type of information to be provided on this page.
  - b. An SSGS display page that provides a graphical representation of the operational status of all SSGS components. Attachment E provides an example illustrating the type of information to be provided on this page. (MOD49, CCR4226C)
76. GTACS shall provide the user capability to generate an event history report. Selection criteria shall include event type, spacecraft, and start/stop times. The event history report shall include all event messages and their event times that meet the selection criteria. (MOD49, CCR4226C)
77. GTACS shall provide the user with the capability to monitor and display all system configuration and engineering global variables available on the respective GTACS server. (MOD49, CCR4226C)
78. GTACS shall monitor and display the configuration, health, and status of the SPSs; and send reconfiguration requests, in accordance with 504-02 message number 110, to the SPS on user request. Attachment F provides examples illustrating the type of information to be provided for display. (MOD49, CCR4226C)
79. GTACS shall monitor and display the configuration, health, and status of the MRS&Ss; and send reconfiguration requests to the MRS&S on user request. (MOD49, CCR4226C)
80. GTACS shall monitor and display configuration, health, and status of the OATS. (MOD49, CCR4226C)
81. GTACS shall monitor and display configuration, health, and status of the RPM. (MOD49, CCR4226C)



82. GTACS shall provide the capability for the user to define an event type for each event via a database. GTACS shall provide the capability to filter the displayed events in realtime based on either the event type, a named list of event numbers, event criticality, or Stream ID. A representative list of user defined filters are as follows:
- a. Tell-all (i.e., events issued to other operational GTACS)
  - b. Visible/audible alarms
  - c. Spacecraft
  - d. Telemetry
  - e. Command
  - f. Command uplink
  - g. Command verification
  - h. Command comment
  - i. Configuration
  - j. User directive
  - k. User response
  - l. OATS
  - m. SPS
  - n. MRS&S
  - o. NTACTS
  - p. System/software error
  - q. Data dropout
  - r. User prompt
  - s. Scheduler
  - t. Telemetry red limits
  - u. Telemetry yellow limits
  - v. PTP
  - w. PM
- (MOD49, CCR4226C)
83. GTACS shall provide the user the capability to develop and manage alphanumeric display pages containing user-defined alphanumeric characters, telemetry values in designated units (raw or EU), global variables, system configuration status variables, and telemetry data quality flags. These display pages shall have the capability to distinctly identify on the display out of limit telemetry values, and distinguish between high and low out of limit conditions. (MOD49, CCR4226C)
84. GTACS shall provide a directive to obtain snapshots of any display page, whether the display page is currently active or not. All current information (including current telemetry values) defined to be on the display page shall be included in the snapshot. (MOD49, CCR4226C)
85. GTACS shall provide the capability for the user to print validation and schedule checker reports. (MOD49, CCR4226C)
86. GTACS shall provide the capability to execute all operator entry keystrokes and valid directives in 2-step mode. The capability to enable/disable 2-step commanding mode shall be provided. Attachment G provides a detailed description of the two-step capability. (MOD49, CCR4226C)
87. GTACS shall maintain the SSGS system configuration status of the yaw flip state. A GTACS directive to set the yaw flip state in GTACS, OATS, and the SPS globally and individually shall be provided. When invoked by the operator, this directive shall issue a 504-02 compliant yaw flip reconfiguration message to OATS and/or the SPS. GTACS shall also monitor the yaw flip configuration status for

OATS and SPS as defined in their respective configuration status messages, and alarm the GTACS operator with an event log message in the event of a yaw flip configuration mismatch. All yaw flip configuration states (GTACS, OATS, and SPS) shall be provided for GTACS monitoring and display. (MOD49, CCR4226C)

88. GTACS shall process workstation status messages and maintain status information on all active client workstations. It shall maintain a configuration list of all workstations signed onto a spacecraft configuration. This configuration list shall be made available for operator monitor and display. GTACS shall alarm the operator with an event log message when a new workstation ID becomes active for the configuration, when a workstation status message indicates a workstation failure, and when a workstation status message is not received in a specified amount of time. (MOD49, CCR4226C)
89. Deleted (MOD49, CCR4226C)
90. GTACS shall provide a generic warning to the operator 30 to 60 seconds prior to the occurrence of a critical command. (MOD49, CCR4226C)
91. The spacecraft contractor shall provide CDRL change page updates for all SSGS documentation affected by above items 24 through 90, inclusive. (MOD49, CCR4226C)

#### 7.2.2 GOES N-Q Telemetry and Command Transmission System (NTACTS)

The NTACTS shall provide the interface between the radio frequency (RF) receive systems at the WCDAS, and the GOES N-Q Telemetry and Command Processing System (GTACS). In addition to the general requirements stated in sections 7.1 and 7.1.2, the NTACTS shall:

1. Be capable of simultaneously supporting both the CDA and the DSN PCM telemetry streams, and the command uplink of one GOES N-Q spacecraft.
2. Support the telemetry and command interfaces with the GTACS via a direct Ethernet connection using the Transmission Control Protocol/Internet Protocol (TCP/IP). (Mod 49)
3. Provide receiver automatic gain control (AGC) data to the GTACS via a direct Ethernet connection using IP, as in item 2 above, and with an update rate equal to that of the fastest PCM telemetry point.
4. Reconfigure from a standby mode to active support of a GOES N-Q spacecraft within one minute.
5. Have no single point of failure or system performance degradation capable of disrupting or precluding real-time telemetry and command processing operations.
6. Provide the capability at WCDA and BUCDA to generate and receive DSN ranging tones through the DSN transponder. (MOD24, CCR4073)

#### 7.2.3 GOES N-Q OATS - In addition to the general requirements stated in sections 7.1 and 7.1.5, the GOES N-Q OATS shall:

1. Retain, as a minimum, the system functional capabilities and equivalent level of operability and performance as specified in the Rehosted OATS Requirements Overview (dated 30 November, 1994), and the Operations Ground Equipment (OGE) Operations and Maintenance Manuals, DRL 504-06, Part 16 of 22 - User Manual, Orbit and Attitude Tracking System.
2. Comply with the SPS and PM interfaces specified in the Operations Ground Equipment (OGE) Interface Specification, DRL 504-02.
3. Have a sufficiently flexible and modular design to accommodate any new data handling, and image navigation and registration (INR) requirements imposed by advanced Imager and Sounder instruments and a LM instrument.
4. Support the INR requirements imposed by the yaw flip maneuver.
5. Use a distributed system architecture with the processing and storage capacity to fully support the simultaneous processing of five spacecraft configurations from a single workstation.